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DEPARTMENT OF THE INTERIOR AND RELATED AGENCIES APPROPRIATIONS FOR 1982

HEARINGS

BEFORE A

SUBCOMMITTEE OF THE

COMMITTEE ON APPROPRIATIONS

HOUSE OF REPRESENTATIVES

NINETY-SEVENTH CONGRESS

FIRST SESSION

 SUBCOMMITTEE ON THE DEPARTMENT OF THE INTERIOR AND
RELATED AGENCIES
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 JOHNSON, *Staff Assistants*

PART 6A

(Pages 1-738)

TESTIMONY OF PUBLIC WITNESSES

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Institute of Museum Services	685

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DEPARTMENT OF THE INTERIOR AND RELATED AGENCIES APPROPRIATIONS FOR 1982

THURSDAY, FEBRUARY 19, 1981.

PUBLIC WITNESSES

ENERGY PROGRAMS FOR FISCAL YEAR 1982

GAS RESEARCH INSTITUTE

DOE GAS RESEARCH

WITNESS

HENRY R. LINDEN, PRESIDENT, GAS RESEARCH INSTITUTE

Mr. YATES. The hearing will come to order.

Our first witness this morning is my good friend and distinguished scientist Dr. Henry Linden, President of the Gas Research Institute which is located in the great City of Chicago.

Henry, your statement may be made a part of the record at this point.

[Material follows:]

(1)

Statement By

Dr. Henry R. Linden, President

Gas Research Institute

Before the

Subcommittee on Interior

Of The

Committee on Appropriations

Of The

United States House of Representatives

February 19, 1981

Mr. Chairman and Members of the Committee:

I am Henry Linden, President of the Gas Research Institute (GRI), a not-for-profit scientific research organization that was formed in 1976 to plan, finance and manage an expanded gas-related research and development program. GRI's membership consists of 197 investor-owned and publicly owned companies which transport and distribute gas in interstate and intrastate commerce. Its activities are funded through a mechanism that is subject to an annual review and approval by the Federal Energy Regulatory Commission and, where intrastate sources of gas are involved, also by the cognizant state regulatory commissions. This mechanism provides for attachment of a uniform funding unit to all gas volumes eventually sold to the ratepayers in order to finance RD&D that the extensive review process has clearly established to be in the public interest and of substantial net benefit to these ratepayers.

The Changed Energy Outlook

I am pleased to appear before you today to discuss my views on the continuing need for a government-industry program to bring to the Nation's energy consumers our huge fossil fuel energy reserves and resources--sufficient for at least 100 years of energy supply even without any supplementation by other energy forms and the anticipated large impacts of conservation. There is a striking contrast between the setting in which I testified last year and the setting this morning. A year ago, the Congress was actively considering an urgent request from the President of the United States to approve a massive, \$88 billion program to create a synthetic fuels industry. The Congress is now getting prepared to consider an urgent request from the President of the United States to make massive cuts in the Federal budget. Last year the Congress moved judiciously to expand the DOE demonstration plant program to utilize Eastern coals and created the Synthetic Fuels Corporation to assist in the financing of commercial synfuel projects. This year the Congress will be asked to terminate or redirect much of what it created last year.

Let me say right at the outset, that much of the new emphasis on letting the market determine the introduction of new energy sources and technologies is basically sound. Moreover, even last year and for some time before it became widely accepted, I was an optimist in regard to the U.S. oil and gas supply and price picture. We are now quite clearly in a period where the concept I have so strenuously advocated--reserving precious liquid fuels for the transportation and petrochemical sectors where they have the highest form value--is being implemented. Combined with the much higher than anticipated elasticity of demand for all

energy forms and, in particular, petroleum fuels, this has relieved the pressure on U.S. and world oil demand to the point where a crisis such as the Iraqi-Iranian conflict can be taken in stride; where the projections for long term OPEC oil production requirements are at 25 million barrels per day or less, rather than well over 30 million barrels; and where substitution of natural gas, coal and other cost-effective energy sources for oil in stationary heat energy uses has become a fundamental tenet of energy policy in most industrialized countries.

All this relieves some of the urgency for production program subsidies for synthetic fuels. However, as I will attempt to outline below, it does not relieve the need for R,D&D which is clearly in the national and consumer interest and which is not being performed in response to market forces for a variety of institutional reasons. Nor does it relieve the urgent need for construction and operation of several first-of-a-kind, pioneer plants based on existing technology which can produce the gaseous and liquid products from coal and oil shale with early prospects for market demands, but which still require confirmation of technical, commercial and environmental viability under U.S. conditions.

Questions About Federal R,D&D Priorities

As head of an organization largely responsible for the development of the advanced technology base of the U.S. gas industry, the massive stream of predictions of budget cuts and shifts for energy R,D&D is of intense interest to me. (See Exhibit 1). Let me hasten to say, we receive no cash flow from DOE, but our roughly \$100 million annual budget is based on substantial cofunding and coordinated funding arrangements with DOE for projects of mutual interest. (See Exhibit 2). This indirectly

provides roughly another \$100 million. In this way, our gas ratepayer-supported program is made more effective by inducing equivalent taxpayer support for what we hope are highly meritorious projects in both the ratepayer and taxpayer interests.

Moreover, I have for a long time expressed my deep concern to DOE and its predecessor agencies about the disproportionate federal support of electric power and, more recently, synthetic liquid fuels R,D&D. Federal support of gas-related R,D&D has lingered at 10 percent or less, although gas has and is expected to continue to play a very major role in meeting U.S. energy requirements. Thus, reports on likely increases in the already huge nuclear R,D&D effort while unconventional natural gas production and advanced utilization technology R,D&D are severely curtailed, further increase my concern about the priorities of the Federal energy R,D&D budget.

Differences Between the Oil, Gas and Electric Utility Industries

I am afraid that in the effort to reduce federal budgets and place the burden of financing research on industry, the inherent structural disadvantages of the gas industry compared to the oil and even the electric utility industry may be overlooked and equity may not be preserved. Some of the proposed measures seem prone to increase rather than decrease existing distortions and may drive the energy market away from least-cost options. For example, measures based on the assumption that the gas and oil industries will show equivalent responses to deregulation, or that the gas and electric utility industries are structurally equivalent, overlook that:

1. Unlike both of the other major energy industries, the gas industry is not vertically integrated so that producer deregulation would put growing pressure on the shrinking margins of the regulated gas transmission and distribution companies without offsetting benefits. The distribution companies could be in particular difficulties if automatic purchased gas adjustment clauses are questioned for deregulated gas in the absence of direct means to send market signals to the producers due to lack of vertical integration.
2. In contrast with the oil industry, return on equity in the utility industry is limited to a rather modest ceiling, so that risky ventures offer no compensating rewards to the utility stockholder. Any benefits in excess of the stipulated return are passed on to the ratepayer--not a very good incentive for equity investment in R,D&D. Again, the lack of vertical integration in the gas industry which imposes constraints on assured rate treatment of new supply options by regulatory bodies, further aggravates its relative disadvantage.
3. The electric utility industry has been able to mitigate some of the serious consequences of earnings limitations by the massive R,D&D support it receives from the large, integrated manufacturers such as GE and Westinghouse for everything from nuclear power plants to consumer products in conjunction with the equally huge federal R,D&D subsidies and favorable climate created by the historic federal preference for all-electric options.

4. The corporate units in the regulated gas industry are small, typically in the \$100 million to \$3 billion revenue range, at least an order of magnitude lower than in the oil industry, which limits the ability to finance ventures whose effective economic size requires investments in the same range as total annual revenues.
5. The recent Great Plains decision puts gas at a further disadvantage compared to the electric utility and oil industries, by making it even more difficult for interstate pipelines to integrate their largest source of long range supply--coal gasification--through financing via the traditional ratemaking mechanism. This contrasts with the normally assured rate treatment by regulatory bodies of new power-generating facilities and the ability of the large oil companies to finance synthetic fuels projects.
6. Finally, the long-range competitiveness of gas in the industrial and power plant markets is impaired by the ability of oil refiners to discount the price of residual fuel oil and recover their costs on the rest of the barrel. The gas industry, with a single commodity, has no such option and, moreover, has to operate under various regulatory constraints on distribution of the high marginal cost of new supplies over its markets.

Potential Impact of Deregulation

It is for these reasons that any simplistic assumptions about the equivalence of gas and oil deregulation insofar as the anticipated benefits are concerned may lead to such consequences as:

1. Further reducing the already minimal federal support of gas-related R,D&D on the assumption that this represents even-handed treatment with liquids-related RD&D.
2. Unrealistic expectations that the demonstrable capability of developing potentially cost-effective gas supplies in the 25-30 quads per year range over the next 20 years will actually develop as a result of producer incentives alone. Unfortunately, adequate markets for this supply may not materialize without a massive gas R,D&D effort because the least-cost supply and utilization options, essential for competition with electricity, coal and fuel oil, will not be available. The result could easily be stagnation of the gas residential/commercial market and severe shrinkage of the industrial market. Moreover, assuming that oil producers will provide the necessary technology investments overlooks the fact that their primary interest is in liquids, not gas. There is little evidence so far of traditional producer investment in the development of advanced Western tight gas sands and Devonian shale gas production technologies, for example. Similarly, the large integrated manufacturers have so far shown little interest in gas options.
3. A reversal in the replacement of imported oil with gas in stationary uses and acceleration of uneconomically high market penetrations of electricity would be the most serious consequence of a scenario in which the existing disadvantages of the gas industry arising from the history of selective subsidies and institutional barriers noted above would be aggravated rather than cured by fundamentally sound measures to restore a free energy market.

In theoretical economic models based on fully internalized costs, gas does well in a totally free market. In all recent exercises of this sort gas either maintains or increases its market share under the constraint of a least consumer cost strategy. Unfortunately, the market is so distorted now and the hand of regulation applied so unevenly that equity will be difficult to establish. If measures designed to achieve market ordering are likely to have such undesirable side effects as increased oil imports, uneconomic levels of electrification and shrinking gas markets, they should be avoided. Further reduction of the already disproportionately low rate of influx of new technology into the gas sector may be the most damaging of such measures.

Alternative Means to Develop the Synfuels Option

Last year I had the pleasure of serving on the Advisory Panel on Synthetic Fuels of the House Science and Technology Committee and in my testimony before the Interior Subcommittee last year emphasized the important conclusions of that distinguished panel, conclusions which have been substantially validated by subsequent events. First, that the Nation should not rush ahead with a production-oriented program because the necessary underpinning did not exist to achieve the highly ambitious production goals anticipated in the first version of the Oil Import Reduction Program proposed by the Carter Administration. While the technology for utilizing our Western low-sulfur coals and shale reserves existed, the technology for utilizing our Eastern resources had not been adequately demonstrated. It was the Advisory Panel's view then and it remains my view today that the goal of producing 2 million barrels of oil equivalent by 1992 could not be achieved without the use of Eastern coals. It is also unrealistic and unfair to expect the Western part of

the Nation to bear the complete burden of supplying the entire Nation with synthetic fuels. We urged a two-phased approach where Eastern coal would be demonstrated under the Department of Energy and first-of-a-kind plants built under the Synthetic Fuels Corporation (SFC) to resolve technical and especially environmental problems before proceeding to achieve a huge production goal.

In 1980, Congress adopted essentially this approach by passing the Energy Security Act which created the SFC to provide federal financial incentives to industry in order to produce 2 million barrels per day of oil equivalent by 1992. The program is to be conducted in two separate phases:

Phase I -- The initiation of the program with appropriations of \$17.9 billion to be used primarily for loan guarantees, price supports, and purchase agreements to achieve a production goal of 500,000 barrels per day of oil equivalent by 1987.

Phase II -- This phase would be initiated after Congress is presented a comprehensive strategy no later than 1984 by the SFC that details how the production goal of 2 million barrels per day will be achieved by 1992. The second phase could cost up to \$68 billion.

In addition to this production program, the former Administration and Congress greatly accelerated the push to demonstrate technologies to use Eastern coals in the form of synthetic pipeline gas, methanol, medium-Btu gas, and liquid and solid boiler fuels. This Committee played a central role by backing the successful initiative to proceed

with both high-Btu demonstration plants. Additionally, Congress determined that the government's very important task of working with industry to demonstrate Eastern coal technology should be kept in the hands of the DOE rather than the SFC in recognition that these were higher risk technologies and required demonstration prior to proceeding to commercial production. Now with the urgent need to reduce outlays, the new Administration is by all accounts examining the demonstration program very hard and is considering the complete elimination of the demonstration plant program, at least as a major component of the DOE Fossil Energy budget.

In restructuring and reducing government involvement and funding in energy it is certainly proper to examine new ideas and mechanisms to achieve valuable goals. However, before any new approach is embraced, it should be examined very closely to be sure it is feasible and has a reasonable chance of achieving the goals. One such option has publicly been discussed by the Director of the Office of Management and Budget. The proposed option to transfer the demonstration plants to the SFC may, indeed, be viable. The Congress should consider it very carefully. Such a transfer of the demonstration plants to the SFC would increase the emphasis on first-of-a-kind plants rather than multiple demonstrations of the same technology. In this new role, the SFC should consider financing the DOE demonstration plants plus as many as possible of the pioneer plants with good commercial prospects for their products. Some of the key advantages of this approach are that it could demonstrate both Eastern and Western technologies, leaves construction management decisions to the private sector, requires significant (40%) cost-sharing by industrial partners, and requires industrial partners to identify markets for the products in order for the plants to be viable business ventures.

If the new Administration and Congress decide to eliminate the DOE demonstration plant program and let the fate of the plants rest with the SFC, it is important to recognize the steps that must be taken for this option to work.

--Provision must be made for the SFC to give the same priority to joint ventures as it gives to purchase agreements, price guarantees, loan guarantees, and loans. Joint ventures currently have the lowest priority.

--The SFC must recognize revenue from the product stream and from foreign partners as an integral part of satisfactory cost-sharing by industry in negotiating joint venture contracts.

--The SFC must recognize that the demonstration plants were intended to be technical demonstrations of new processes. The plants under DOE were to have up to 36 months of testing using different coals and different modes of operation before the plant is dedicated to producing a commercial product. The cost of testing must be included as an acceptable cost of a joint venture or else this provision must be revised during negotiations.

--DOE demonstration plants were sized and designed to meet research objectives, not production goals. Therefore some redesign or change in proposed size may be required before these plants are viable as a joint venture.

--The SFC is mandated to meet specific production goals. Since the urgency to achieve these production goals is questionable compared

to the urgency of building a sound resource and technology base, the fact that the demonstration plants will offer little assistance in meeting the 1987 production goals and will absorb a substantial portion of the initial appropriation to the SFC should not be considered a negative factor.

Importance of the Eastern Coal Option and Synfuel Program Balance

Regardless of the approach, the need to demonstrate the Eastern coal option is as valid today as it was a year ago. The rapid development and demonstration of advanced processes to utilize the Nation's vast resources of Eastern caking coal must play a critical role in a truly national synfuel program because (1) the recoverable coal resources in the East--mostly bituminous--are as great as those of the West, which are mostly lignite and subbituminous; (2) water is more readily available in the East; (3) markets are closer to points of production in the East; and (4) the skilled manpower pool and manufacturing resources are much greater in the East. Without the Eastern coal option, it probably will not be possible to simultaneously develop the uranium, oil shale and non-caking coal deposits located in the Western Great Plains and Rocky Mountains. Development of all of these resources at the same time will lead to intensive competition for scarce water, labor, materials and infrastructure resources and, possibly, prevent the synfuel option from being fully developed and implemented.

Whatever the final structure for providing financial support and incentives turns out to be, the technical capability, economic viability and environmental acceptability of synthetic fuels should first be confirmed by building pioneer shale and coal plants in the West and

demonstration plants to gasify and liquefy Eastern coal. Because of the unknowns--technical, economic, environmental and institutional--it is better to start the program with a representative mix of pioneer plants under the authority of the SFC and of demonstration plants under DOE or joint venture authority of the SFC that use a diversity of technologies, raw materials, environmental conditions and financing and institutional arrangements. The primary purpose of the first phase should be the resolution of these unknowns. Without a broad mix of technologies capable of using a range of energy sources to produce a wide spectrum of gaseous and liquid fuels, the goal of the second production phase will be difficult to achieve.

This approach is not in conflict with proposed energy R,D&D and SFC budget constraints or the highly desirable goal to give market forces more play in making synfuel investment decisions. Clearly, there is a growing consensus that such first generation options as Western coal gasification; conversion of coal-based medium-Btu gas to methanol and/or gasoline and to pipeline quality gas; and several of the Western shale oil processes are early candidates for commercial viability. Federal subsidies requiring actual cash flow from the Treasury for pioneer ventures based on these technologies can probably be largely avoided by proper structuring of the incentives. The more risky direct liquefaction and Eastern coal gasification options will require cash flow, but it can again be limited by restricting the size of demonstration plants to the practical minimum.

Role of Gasification in Synfuel Program

All of the proven commercial processes to convert coal to liquids are based on the indirect liquefaction technology which utilizes synthesis

gas as the first major step. The synthesis gas is catalytically converted to produce methanol or Fischer-Tropsch liquids (diesel fuel and gasoline). Therefore, synthesis or medium-Btu gas is key in all near-term indirect liquefaction processes. Additionally, all of the direct liquefaction processes under development in the DOE program use a gasification process to produce hydrogen. This is an essential step in the process.

Without the coal gasification demonstration plant program fully funded and integrated into the nation's synfuel program, the synfuel option will not only remain largely a Western option for the time being, but the development and commercialization of several liquefaction technologies will be hampered by the current slow pace of improved gasifier technology development and demonstration. The inclusion of the coal gasification demonstration plants in any synfuel program gives the Nation the option to use all of our coal resources and will distribute the burden of development. This ultimately will ensure a truly viable synfuel energy option and may indeed accelerate rather than retard the development of a substantial liquid synfuel production capability in the 1990 to 2000 time frame.

Future Role of Gas

It is important to review the Federal perception of the role of gas, both natural and synthetic, in the national energy supply to avoid repetition of past mistakes. The most serious of the erroneous premises of the past has been the assumption that the best way to handle the natural gas shortage is to restrict the markets for gas in favor of other energy forms such as liquid fuels, coal, and electricity, despite the fact that potentially abundant natural and synthetic sources of gas frequently offer a more economic and environmentally more acceptable fuel option.

Restricting the market for gas because it is "scarce" can lead to the self-fulfilling prophecy that there is enough gas to meet demand so that new gas supply initiatives are not needed. Fortunately, the recent period of pessimism about the gas supply potential has come to an end and the need for market restrictions has been increasingly questioned in view of the continuing "gas bubble." Congress has removed many of the barriers to realistic gas pricing through passage of the Natural Gas Policy Act and reserve additions have shown the expected response. These developments have set the stage for a reassessment of the role of gas in the U.S. energy future.

The "Gas Option" provides the most near-term and cost-effective route to achieving greater energy self sufficiency. The basic premise of the "Gas Option" is that gas from conventional and unconventional natural sources and from a wide variety of synthetic sources could and should maintain at least its current position in meeting the Nation's energy supply. This translates into a minimum economic demand for pipeline-quality gas of about 21-22 Tcf in 1985 and roughly 25 Tcf in 2000. Depending on the actual trend of total energy requirements and of competitive energy service costs, the economic demand for gas could be higher, perhaps as much as 25-30 Tcf in 2000, but under no foreseeable circumstances would it fall below current rates of consumption, i.e., 20-21 Tcf annually. (See Exhibit 3)

Exercising the gas option, in contrast with alternatives calling for a diminishing share of gas, would be less inflationary, environmentally more desirable, less disruptive to energy consumers, and more efficient in terms of resource and capital utilization. Moreover, because oil and all forms of natural gas and its synthetic substitutes are interchangeable

energy sources in most stationary applications, every annual increment of pipeline-quality gas supply of 2 Tcf (equivalent to roughly 10% of current consumption) replaces one million bbl per day of oil imports. (See Exhibit 4)

In conjunction with other gas supply initiatives, slowing or temporarily arresting the decline in conventional domestic natural gas production would allow the lifting of restrictions on gas sales, including sales to a substantial segment of the industrial market. Less than 8 Tcf of the 20-21 Tcf of current gas consumption is used in the high-priority residential/commercial market so that industrial and power plant sales are essential to the preservation of the high load factors which contribute so much to the economic operation of gas pipeline systems by minimizing the impact of fixed costs.

The key to the near-to-mid-term implementation of the Gas Option is the rapid development of the unconventional natural gas resources. The Gas Research Institute (GRI) has performed an analysis to forecast the production potential of unconventional natural gas resources under various sets of assumptions concerning wellhead price and new technology development. The relatively near-term (i.e., available in significant quantities in the 1990-2000 time frame) resources include:

- o Western tight gas sands
- o Eastern Devonian gas shales
- o Methane from coal seams

In addition, GRI also analyzed the potential of methane production from the geopressured zones underlying the Gulf Coast area.

This analysis has shown that a large production potential exists.

By 1990, unconventional sources, using existing technology, could supply annually an additional 1 Tcf (above current production of 0.8 Tcf of Western tight sands gas and 0.1 Tcf of Eastern Devonian shale gas) at wellhead prices in the \$3.00-\$6.00 per Mcf range (1979 dollars). Gas production could be significantly increased by the year 2000 to a level of from 2.6 to 4.5 Tcf annually using existing technology. The successful development of advanced technology has a major impact and could result in annual production levels ranging from 5.1 Tcf to 8.9 Tcf priced at \$3.00 and \$6.00 per Mcf, respectively, (1979 dollars) by the year 2000-- the equivalent of 2.5 to 4.4 million barrels of oil per day. Although in a recent study by the American Gas Association Gas Supply Committee, the expected range of additional Western tight sands and Eastern Devonian shale gas production in 2000 was downrated to 1.5 to 5 Tcf because of a variety of expected institutional barriers and resource and technology uncertainties, a new study by the National Petroleum Council supports GRI's view of the production potential and its response to improved technology.

The most significant finding of the GRI analysis was that the maximum quantity of gas which could be produced is at least as technology dependent as price dependent. Doubling the wellhead price from \$3.00 per Mcf to \$6.00 per Mcf using existing technology increased total potential production from the three near-term resources by about three-fourths; whereas, at each of the price levels, advanced technology has the potential to double gas production. The potential impact of higher wellhead prices and the development of new technology on the size of the recoverable resource gas of each of the three near-term unconventional gas resources was similar, i.e., the size was quite responsive to price increases but also doubled or tripled with new technology.

GRI compared its analysis with the 1978 Lewin and Associates study and the recent National Petroleum Council study. These studies were reduced to constant 1979 dollars, and gas price levels were interpolated to permit a consistent comparison. (See Exhibit 5) The GRI estimates of the recoverable resource bases and production were generally conservative compared with the Lewin and NPC studies.

The soon to be released National Petroleum Council study projects a huge potential recovery of gas from tight gas formations. The "potential ultimate recovery is projected to be in the range of 192-572 trillion cubic feet (Tcf) for the total United States (excluding Alaska). This is equivalent to approximately 33-98 billion barrels of crude oil."

The NPC estimates that "It is possible that by the year 2000 as much as 4-16 Tcf of tight gas could be produced annually. These levels of production could account for 4-14 percent of total U.S. energy requirements in the year 2000. Potentially insecure and expensive oil imports could be reduced significantly by the year 2000 with a concerted development program of lower cost tight gas."

The NPC report also found that the "Development of the U.S. tight gas resource will be as dependent on advances in technology and changes in well spacing rules as on price." The NPC estimates that "Future advanced technology will provide approximately 50 per cent more recoverable gas than current base technology." It will possibly take six to ten years of intensive research and approximately four to eight years of development to achieve fully advanced technology for widespread routine application."

This is an extremely important point because the DOE enhanced gas recovery R&D budget is often attacked on the grounds that the production of unconventional gas is price dependent rather than technology dependent. It is now becoming increasingly clear that this assertion is incorrect and that a substantial R&D program is needed to achieve maximum production from our unconventional natural gas resource. This R&D is not of great interest to the existing producing industry because its interest is focused primarily on liquids for which the markets and returns are better defined, and, therefore, more attractive. Moreover, as noted before, the major segments of the industry will remain under regulation and producer deregulation is more likely to hamper than to enhance their capability to make equity investments in new supply technologies. Thus, private efforts need to be supplemented by public funds.

GRI's strong interest in unconventional natural gas resources stems from the sensitivity to the application of new technology developed through an aggressive R&D program and the potential early contribution of these resources to domestic gas supply at prices which are highly competitive with other alternatives. GRI has stated in the past that to implement such an aggressive unconventional natural gas R&D program will require a DOE budget on the order of \$100 million per year for at least five years for programs to improve resource characterization methods, refine well and stimulation technology, and determine an orderly path to commercialization. GRI plans to supplement the DOE effort with \$75 million over the next five years. The proposed combined budgets for unconventional natural gas R&D for GRI and DOE are less than \$600 million over the next five years. While this is a substantial commitment of public funds, the potential benefits in terms of reduction of the U.S. energy bill and dependence on imports dwarfs this investment and appears

to outweigh the benefits from many other public investments in domestic energy supplies now being actively pursued.

Efficient Utilization R&D

There are many joint DOE-industry research programs aimed at utilizing energy more efficiently that are substantially cost-shared by industry and require continued federal subsidies to overcome barriers to commercialization. A good example is the On-Site Fuel Cell Program that GRI and member utilities are jointly funding with DOE. Over 20 GRI member utilities have pledged approximately \$15 million to the field tests of 45 units of the 40 kW phosphoric acid fuel cell. In 1980, GRI had numerous discussions with DOE and OMB on the appropriate government and industry roles in funding the field test and the commercial development activities. It was agreed that the funding of technology development was a more natural role for government and that industry should fund a larger share of the field test. GRI agreed to increase its funding of the field test by \$8.5 million and DOE agreed to pursue phosphoric acid technology development with GRI's support. DOE will require at least \$16 million for phosphoric acid fuel cell technology development in FY 1982 to support the technology development activities associated with the joint DOE/GRI/utilities on-site fuel cell program and the competitive technology development programs being initiated by DOE. I strongly support these activities since they are critical to the eventual commercialization of this dispersed total energy system. While I recognize that this will be an austere year, I sincerely hope that the Congress will continue to support efficient utilization programs such as the on-site fuel cell program.

Other efficient utilization R&D programs which are primarily designed to reduce specific gas consumption and enhance consumer benefits also require cofunding by DOE because, as pointed out earlier, the manufacturing sector is primarily electricity-oriented because of years of federal intervention detrimental to both gas supply quantity and certainty and public acceptance of gas as a desirable energy source for consumer services. Development of gas heat pumps is just one of several examples.

Summary

Much of the new emphasis on letting the market determine the introduction of new energy sources and technologies is basically sound. However, there is a continuing need for Federal support of R,D&D which is clearly in the national and consumer interest and which will not be performed by the private sector in response to market forces for a variety of institutional reasons. In its examination of the FY 1982 budget, I ask the Committee to consider:

- o Competing energy sources should be considered equitably with due recognition to the inherent differences in structure, size, regulatory constraints, market position, and capability to fund R,D&D of the industries providing these energy sources.
- o If measures intended to achieve market ordering have such undesirable side effects as increased oil imports, uneconomical levels of electrification and shrinking gas markets, they should be avoided.

- o The need to demonstrate the ability to gasify and liquefy Eastern coals is as strong today as it was a year ago.

- o The SFC must give the same priority to joint ventures as to other financial incentives if demonstration plants are to be built under the SFC.

- o Unconventional natural gas is an important resource whose production, according to the National Petroleum Council, will be "as dependent on advances in technology and changes in well spacing rules as on price." Private R&D efforts need to be supplemented by public funds because traditional producer interest in developing enhanced recovery techniques is primarily focused on liquids and the gas industry has limited capabilities to make the necessary investments.

- o New efficient gas utilization technologies need federal R&D support because the needs of the gas consumer are not fully served by equipment and appliance manufacturers. Gas fuel cells and heat pumps are prime examples meriting such support.

That concludes my formal testimony. Again, I thank the Committee very much for the opportunity to testify. I will be glad to answer any questions you may have.

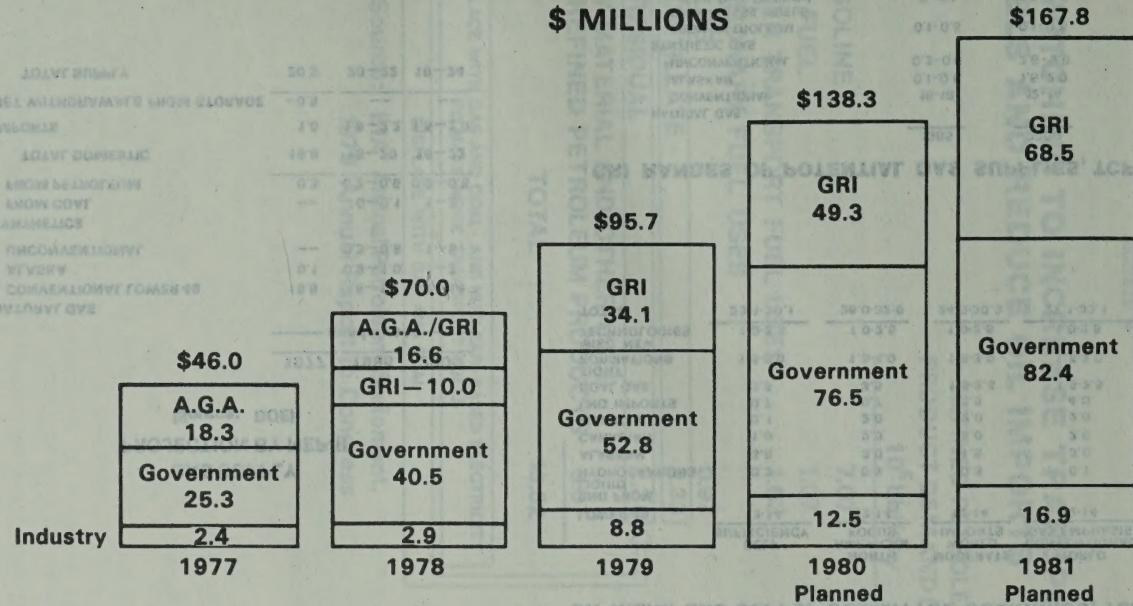
EXHIBIT 1

GRI Five-Year Plan Budget Allocation Summary
(\$1,000)

		Budget Summary					
		Approved		Planned (Constant 1981 dollars)			
		1980	1981	1982	1983	1984	1985
I.	RESEARCH AND DEVELOPMENT	49,315	68,500	85,400	99,975	110,190	121,985
	Supply Options	26,260	31,625	37,700	43,950	48,620	54,000
	Near-Term	7,000	10,850	15,250	17,900	18,850	19,900
	Mid-Term	17,400	18,075	19,100	21,990	24,210	26,240
	Long-Term	1,860	2,700	3,350	4,060	5,560	7,860
	Efficient Utilization	16,810	26,950	35,120	41,750	46,100	50,800
	Near-Term	5,010	7,200	8,800	10,350	10,750	10,100
	Mid-Term	11,595	19,250	25,590	29,900	33,550	38,600
	Long-Term	205	500	730	1,500	1,800	2,100
	Enhanced Services	3,920	6,055	7,700	8,275	8,840	9,825
	Near-Term	3,735	5,755	7,255	7,625	7,640	7,775
	Mid-Term	0	0	0	0	0	0
	Long-Term	185	300	445	650	1,200	2,050
	Fundamental Research						
	(Long-Term)	2,325	3,870	4,880	6,000	6,630	7,360
II.	TECHNICAL PROJECT MANAGEMENT	1,606	2,201	2,820	3,250	3,520	3,800
III.	GENERAL & ADMINISTRATIVE EXPENSES	6,813	8,299	10,280	11,550	12,980	14,500
	A. Planning and Analysis	1,773 ^a	1,646	1,800	1,850	1,850	1,850
	B. Communications	335	522	700	900	950	1,000
	C. General Operating Expenses	4,705	6,131	7,780	8,800	10,180	11,650
IV.	SCIENCE AND TECHNOLOGY	0	1,500	2,000	2,000	2,000	2,000
	TOTAL GRI BUDGET	57,734	80,500	100,500	116,775	128,690	142,285

^a This 2.3 (2.3.2 Systems Analysis) moved to Planning & Analysis per FERC Staff Report, 7/23/79

GRI COORDINATED FUNDING



**SUPPLY PROJECTIONS FOR THE YEAR 2000 BASED
ON A.G.A. GAS SUPPLY COMMITTEE SCENARIOS, TCF**

**GAS SUPPLY
PROJECTION BY NEP-II
(Source: DOE)**

	1977	1985	2000
	quads/year		
NATURAL GAS			
CONVENTIONAL LOWER 48	19.8	16-18	12-14
ALASKA	0.1	0.8-1.0	1-2
UNCONVENTIONAL	--	0.3-0.8	1-5
SYNTHETICS			
FROM COAL	--	0-0.1	1-2
FROM PETROLEUM	0.3	0.2-0.5	0.2-0.5
TOTAL DOMESTIC	19.8	16-20	16-22
IMPORTS	1.0	1.8-2.2	1.5-2.0
NET WITHDRAWALS FROM STORAGE	-0.6	--	--
TOTAL SUPPLY	20.3	20-22	18-24

	SELF SUFFICIENCY	NORTH AMERICAN FOCUS	MODERATE WORLD IMPORTS	WORLD CONVENTIONAL GAS EMPHASIS
	12-14	12-14	12-14	12-14
LOWER-48				
SNG FROM LIQUID HYDROCARBONS	0.3	0.3	0.3	0.1
ALASKAN	3.0	3.0	1.5	3.0
CANADIAN	1.0	2.0	2.0	2.0
MEXICAN	0.1	2.0	2.0	2.0
LNG IMPORTS	0.7	0.7	2.5	4.0
COAL GAS	3.5	3.5	1.5-2.5	1.5-2.5
TIGHT FORMATIONS	1.5-5.0	1.5-4.0	1.5-3.0	1.5-3.0
MISC. NEW TECHNOLOGIES	1.0-2.5	1.0-2.5	1.0-2.5	1.0-2.5
TOTAL	23.1-30.1	26.0-32.0	24.3-30.3	27.1-33.1

GRI RANGES OF POTENTIAL GAS SUPPLIES, TCF

	1985	2000
NATURAL GAS		
CONVENTIONAL	16-18	12-14
ALASKAN	0.1-0.8	1.5-2.0
UNCONVENTIONAL	0.2-0.6	2.6-9.9
SYNTHETIC GAS		
FROM PETROLEUM	0.1-0.5	0.1-0.5
FROM FOSSIL FUELS (Coal, Peat, Oil Shale)	0-0.1	1.5-4.5
FROM BIOMASS AND WASTES	--	0.1-1.0
PIPELINE IMPORTS		
CANADIAN	1.0-1.5	1.0-1.5
MEXICAN	0.1-0.5	0.5-1.0
LNG (incl. Alaskan)	0.5-0.8	0.5-1.5
TOTAL	18.0-22.8	19.8-35.9
PROBABLE RANGE	18-22	25-30

EXHIBIT 4

FUEL SWITCHING TO INCREASE TRANSPORT FUELS AND REDUCE OIL IMPORTS

REFINED PETROLEUM
PRODUCT DEMAND (1979),
10⁶ bbl/day

GASOLINE	7.07
JET FUEL	1.07
OTHER TRANSPORT FUEL USES	1.63
STATIONARY FUEL USES	
LPG	0.97
DISTILLATE	2.33
RESIDUAL	2.38
RAW MATERIAL AND OTHER USES OF REFINED PETROLEUM PRODUCTS	3.07
TOTAL	18.52

DISPLACE WITH GAS AND COAL - AND NUCLEAR - BASED ELECTRICITY
TO MAKE MORE TRANSPORT FUELS

DISPLACE WITH GAS AND COAL

Data Source: EIA Annual Petroleum Statement,
1979 Annual Report to Congress

Exhibit 5

COMPARISON OF ESTIMATES OF UNCONVENTIONAL NATURAL
GAS RESOURCES AND PRODUCTION
(1979 DOLLARS)

	Economically Recoverable Resources (Tcf)				Production Potential in the Year 2000 (Tcf)		
	GRI	Lewin	NPC		GRI	Lewin	NPC
<u>Western Tight Gas Sands</u>							
Existing Technology	\$3.12	30	90	235	1.99	4.1	-
	\$4.50	45	104	330	2.51	-	-
	\$6.00	60	-	375	3.31	-	-
Advanced Technology	\$3.12	100	170	374	3.44	6.8	6.6
	\$4.50	120	185	467	5.21	-	7.9
	\$6.00	150	-	519	6.04	-	8.9
<u>Eastern Devonian Shale</u>							
Existing Technology	\$3.00	10	6.1	9.4	0.31	0.19	0.42
	\$4.50	15	9.6	16.6	0.55	0.33	0.78
	\$6.00	25	-	21.0	0.82	-	0.93
Advanced Technology	\$3.00	20	12.1	15	0.70	0.40	0.64
	\$4.50	30	19.5	24	1.00	0.73	1.06
	\$6.00	45	-	29	1.50	-	1.25
<u>Coal Seams</u>							
Existing Technology	\$3.00	10	-	6.0	0.29	-	-
	\$4.50	15	-	16.8	0.35	-	1.5 ^a
	\$6.00	30	-	25.3	0.42	-	-
Advanced Technology	\$3.00	30	1.3-19.2	-	0.95	-	-
	\$4.50	40	1.6-24.6	-	1.2	-	-
	\$6.00	60	-	-	1.4	-	-
<u>Geopressured Zones</u>							
Advanced Technology	-	-	3.6	0.24-0.57 ^b	0-1	-	0.01-0.03 ^b

a) Production by vertical well technology; price sensitive projection not available.

b) Projection is based upon "best prospects" known to date.

Mr. YATES. I look forward to reading your statement with a great deal of interest but give us a summary of what you think we ought to be doing.

Mr. LINDEN. Shall I dispense with the usual opening?

Mr. YATES. Sure, don't compliment me at all.

Mr. LINDEN. I do need to compliment you. Elegant appearance is the minimum.

As you said, I am Henry Linden, President of the Gas Research Institute which plans, finances and manages a cooperative gas-related research and development program for the U.S. gas industry under the jurisdiction of the Federal Energy Regulatory Commission and for intrastate gas that is involved under the jurisdiction of the cognizant State commission. We are very much interested in the developments in the DOE budget and in the relationship of the Synthetic Fuels Corporation to the overall energy R, D&D program.

We finance about \$100 million of gas-related R, D&D and to maximize the benefits of this program we co-fund roughly one to one with DOE and industry so that the whole program is co-funded on \$100 million a year.

The comments I would like to make today relate to the need for a continuing government/industry cooperative program in fossil energy R, D&D because of the obvious need in bringing to the consumer in the United States through some form of less cost strategy the huge fossil energy resources when you take gas, oil, shale oil and coal to well over 100 years of energy supply even without implementation with solar, nuclear and the other new sources so this is very significant to us. We, of course, are quite interested in the concept of having market forces make a greater impact on the decision-making process and indeed the environment has changed since I last testified before this committee.

The world oil situation has moved in the direction that many of us predicted; namely, that the demands for oil and, of course, energy sources has developed to the point where the world oil supply could take more without any major upset and where we now talk about the need for OPEC oil being at 25 million barrels a day or less and other economic levers which everyone fears.

Indeed the pressure on multiple production of related programs for synthetic fuels has been somewhat relieved although the pressure on developing a sound technology base for synthetic fuels has not. One of the remarks that I make in my formal testimony is, of course, that an essential component for the energy future of the United States is to have full steam ahead on the demonstration-planned program for synthetic fuels and the first-of-a-kind pioneer-planned program.

Mr. YATES. How extensive did you make that demonstration program? In what fields would you have your demonstration? Would you include oil shale in that?

Mr. LINDEN. Yes. It is extremely important as a component of the demonstration program to develop the eastern coal option because the western option which is, of course, commercially possible today will limit the lesser phase both in terms of water, coal and environmental infrastructure to a point where I do not believe it would be adequate to fully supply the eventual synthetic fuels of

this country. The eastern coal option would largely be a product of the demonstration-planned program so it is one of the reasons why it is so important. All elements should be involved in this demonstration program in terms of coal, geographic region, environmental situations and product mix.

HYGAS

Mr. YATES. Let me interrupt you again. I know that the time is precious here today but it is not very often we get such a talented witness as you before us.

The President in his message has approved funding of SRC-I and SRC-II and he has recommended in his budget message that the funding for the hygas plants in Illinois and Ohio be terminated. Would you agree with this?

Mr. LINDEN. No, I would not. One of the points I address in my testimony is particularly the question of equity. In terms of synthetic fuels clearly there are differing capabilities of different elements of the U.S. energy industry in advancing the technology base which is the whole base of the energy consumer needs, so to selectively pick liquefaction and certain technologies and prejudge the ability of the free market to handle the rest of the options I think is premature. There ought to be equity in terms of liquefaction, in terms of the facts of liquefaction and as direct and indirect and in terms of eastern and western options and shale, and of course within each of these options there are different types of gas.

One of the important things that we all have learned as we have studied the problem is that gasification is really a key element for all synthetic fuel technology. In the first step, in making coal and steam and oxygen, it is essential that there be a dichotomy by conversion of methanol or what have you.

Mr. LOEFFLER. Dr. Linden, why do you say that the efforts now, to withdraw some of the funding, are premature?

Mr. LINDEN. Well, because there is very little evidence really that certain segments of industry are indeed capable on their own to co-fund to the level necessary or to assume the full financial burden. For example, the gas industry which is not vertically integrated and which is hampered by limited earnings return on equity does not have the capability to finance large pioneer plans or demonstration plans. Many of the gasification options definitely need some form of Federal incentives and subsidy, so to selectively remove gasification would certainly be an error.

Also, it is disturbing that while nuclear, which is certainly an important element in the U.S. energy mix and in the long-term future, is slated for a major increase. Unconventional natural gas, which is one of the really near term low-cost options for domestic supplies which could double our coal reserves according to the National Petroleum Study which is just coming out and could supply 10 percent of the energy supplied by the year 2000, is being severely cut back in the budget as I understand it today.

So it is for these reasons that it is important to look at the ability of the U.S. energy industry, each of its segments, to do certain parts of these energy R, D&D programs.

Mr. YATES. We supplement it as Mr. Loeffler said.

Did your testimony respecting the estimate by the American Gas Institute include development of the brine areas in both Texas and Louisiana?

Mr. LINDEN. Yes. The methane which is continuing to be funded at some substantial level is one of the longer term options. It is technologically less well defined, less well determined in terms of resource and very much more in terms of economics. The unconventional sources I am addressing as the near term ones and of course the methane.

Mr. YATES. What do you mean by near term as opposed to far term?

Mr. LINDEN. Development at current well head price levels competitive with any other energy supply option in quantities prior to 2000 are truly significant, the equivalent of several million barrels of oil a day.

Mr. LOEFFLER. Why is the geopressurized gas not a resource you would consider in the short-term?

Mr. LINDEN. Because really the resource base has not been adequately defined for the production technology. It is a relatively risky technology. It has received much media attention because its potential size could be so huge but it requires more research and development, more research analysis than any of the others but it is certainly a meritorious area and we co-fund very heavily with DOE in the methane area.

Mr. YATES. Following that up again, should we be putting more money into the research and development of that area in order to bring its possibilities into actuality in a closer period?

Mr. LINDEN. We have recommended for the last several years, starting with Secretary Schlesinger who agreed with us, that DOE should fund \$100 million a year for a minimum of five years—\$100 million a year—in the unconventional natural gas area which includes geopressure. The Gas Research Institute's five-year plan provides for \$75 million of funding from us. We are proceeding to fund \$75 million but we feel that the consumer interest, this being the really lowest cost option of key energy supply, merits substantial public funding.

SRC-I AND SRC-II

Mr. YATES. Well, you talk about \$75 million and I think that the cost of SRC-I and SRC-II and the cost by some of the other clients, I wonder whether \$75 million will bring us the research we need. Should it not be increased beyond that?

Mr. LINDEN. I am talking about our own limited means. We are talking about \$500 million from DOE to co-fund our \$75 million.

Returning to this question of allowing market forces to do the job, there are such differences between the oil industry, the electricity utility and the gas industry that it will not apply. The corporate units are large, they are vertically integrated and producer deregulation benefits them. The gas industry is not vertically integrated. The use of deregulation makes it very much more difficult for the gas industry to fund anything because it puts a squeeze on the controlled prices by state regulatory commissions and the high marginal cost of new gas supplies.

The electric utility industry has been the beneficiary of very huge Federal R&D subsidies; they have received subsidies on the order of \$40 billion for a nuclear loan and during the DOE days they have always been funded at about 75 percent to 80 percent whereas gas options are funded at 10 percent.

Mr. LOEFFLER. How do you distinguish between the oil and gas industry? If they have gas production, they are really the energy industry, energy corporations. So when you try to delineate between the oil producers and the gas producers, are they vertically or horizontally integrated companies? It is very difficult. I don't follow your distinction. There are no just gas people and no just oil people.

Mr. LINDEN. The regulated gas industry consists of the interstate pipelines and the distribution companies. The distribution companies are under the jurisdiction of 50 State regulatory commissions and the interstate pipelines are under the jurisdiction of State regulatory commissions. They produce less than 10 percent of the commodity they use. They buy across the fence so that this is a totally different situation compared to the oil industry which is vertically integrated and the electric utility industry which is also vertically integrated with most of its generating capacities.

We recently had a court decision, the so-called Great Plains decision, referring to the coal gasification project which in essence says that the interstate pipelines cannot use the traditional rate-making mechanism to fund its coal gasification, for example, which is quite a distinct difference in treatment from the electric utility industry which indeed can use the conventional rate-making forces to build power stations and this is why very simplistic treatment of free market forces as it affects all of the energy industry does not work. We do have 25 percent or more of the year's total energy supply in gas and the gas supply prospects look very bright. The question is, are there going to be markets for them?

This brings me to another part of the testimony, the efficient utilization. Again the electric utilities like G.E. and Westinghouse will co-fund, the gas industry does not. We have a large number of utilization options with very high efficiencies—gas heat pumps, fuel cells in particular—which again requires substantial coal funding. We are disturbed and worried about the assumption that there will be a free market response to gas deregulation that will produce more efficient gas equipment and appliances. This is not very likely. In fact, the opposite may very well happen. Oil imports shrink and gas imports increase.

Mr. YATES. What is the alternative? How do we get Westinghouse and G.E. and the others to go into the gas industry?

Mr. LINDEN. That is why Gas Research Institute exists. We have induced people to make a decision mostly to go with electric options or to consider options by co-funding as with G.E. in many areas, and Westinghouse and others and have them take a fresh look at the long-term economics and consumer benefits and market potential of gas as an energy service option. We are indeed quite successful but we cannot do it all alone, we do need co-funding.

Mr. YATES. Is all this in your statement?

Mr. LINDEN. Yes.

Mr. YATES. We are going to have to stop, we have some other witnesses waiting.

Mr. DICKS. So the bottom line is that the immediate deregulation of natural gas, with the resultant doubling of prices is going to hurt your marketing efforts, isn't that the problem?

Mr. LINDEN. Yes.

Mr. DICKS. You are trying to tell us that when the price of gas doubles it is not going to be attractive.

Mr. LINDEN. It is not going to be as attractive.

Mr. DICKS. So you believe the phased deregulation as outlined by Congress is the proper approach?

Mr. LINDEN. Yes.

Mr. DICKS. Thank you.

Mr. YATES. Thank you.

Any questions, Mr. Loeffler?

Mr. LOEFFLER. No.

Mr. YATES. Thank you, Henry.

Mr. LINDEN. Thank you.

INTERNATIONAL COAL REFINING COMPANY

DOE—SRC—I DEMONSTRATION PLANT

WITNESSES

THOMAS PEACOCK, INTERNATIONAL COAL REFINING COMPANY
STANLEY MORRIS, VICE PRESIDENT, ENGINEERING TECHNOLOGY
WESLEY TIMMCKE, VICE PRESIDENT, CONTRACT ADMINISTRATION

Mr. YATES. International Coal Refining Company, Thomas Peacock. I am sorry to delay you, Mr. Peacock, but we will probably wind up doing the same with every witness because of the interest in the subject matter.

Mr. PEACOCK. Mr. Chairman, I will not be testifying. We are represented by two Vice Presidents.

Mr. YATES. Your statement will be made a part of the record. [Material follows:]

Stanley Morris - Vice President -- Engineering Technology

Wesley Timmcke - Vice President -- Contract Administration

INTERNATIONAL COAL REFINING COMPANY

Mr. Chairman, Members of the Subcommittee, my name is Stanley Morris and I am Vice President -- Engineering Technology with the International Coal Refining Company (ICRC) of Allentown, Pennsylvania. With me today is Mr. Wesley Timmcke, who is Vice President -- Contract Administration for ICRC. It is a pleasure for us to be here today to report on the status of our work in cooperation with the Commonwealth of Kentucky and the U. S. Department of Energy.

Our testimony addresses Department of Energy Line Item 78-2 D, the SRC-1 Coal Liquefaction Demonstration Project. In its Fiscal Year 1982 Budget the previous Administration requested \$496.5 million for this project. Taking into consideration changes in the project schedule we believe a Fiscal Year 1982 Appropriation of \$325 million will be sufficient.

As you know, ICRC is performing work under a Department of Energy Contract that calls for the design, construction, testing, operation, evaluation and ownership of a demonstration-sized solvent refined coal facility. The technology to be demonstrated by this facility will produce competitively-priced environmentally-safe energy products that can replace those we now derive from petroleum.

We are submitting for the record of the Subcommittee a detailed report of our activities to date under this contract. To save valuable time, I ask your permission to summarize our report in a few

Mr. Yarns: Is all this in your statement?

Mr. Latham: Yes.

Mr. Yarns: We are going to have to stop, we have some other witnesses waiting.

Mr. Dixon: So the bottom line is that the immediate deforestation of natural gas with the resultant doubling of prices is going to hurt your marketing efforts, isn't that the problem?

Mr. Latham: Yes.

minutes here this morning, so that we can devote time to answering your questions about this project and about its place in America's energy future.

For the past decade, the two companies which formed ICRC have worked to perfect direct coal liquefaction technology. Others also have worked hard and long to develop other coal based synthetic fuel technologies that hold the promise of meeting part of our needs through the energy transition period.

Of the technologies available today, we believe the SRC-I technology chosen by ICRC is the most promising. ICRC's choice of two stage direct coal liquefaction produces a flexible, market-responsive product slate that can meet a full spectrum of energy needs for utilities and industry. The ICRC product slate includes gasoline blendstocks, thus this technology also has applications for individual consumers of transportation fuels.

ICRC technology is much more efficient than the synfuels technology used in South Africa, and has an efficiency advantage over the other direct hydrogenation processes under development in this country. Direct liquefaction produces about three barrels of oil equivalent products per ton of coal rather than the two barrels of such products derived from indirect liquefaction of the same ton of coal.

Further development of direct liquefaction technology will permit us in the United States and our allies in Europe and elsewhere to use American coal as an alternative to oil. Full development of this technology could give our allies in western Europe -- in the 1990's -- an alternative energy source to the two which are now available to them -- O.P.E.C. and the Soviet Union.

Even though the demonstration nature of the SRC-1 Plant precludes utilities and industries from making future marketing decisions based solely on the limited output expected from the first module, there certainly is no lack of interest on the part of potential synfuel users. Agreements to purchase the clean-burning solid product from the demonstration plant actually exceed the supply currently anticipated. Furthermore, several firms also have requested a first option on the output from the first commercial SRC-1 Plant. If these options are exercised, all of the first SRC-1 commercial plant solid products would already be committed.

As an expanded commercial refinery operating in 1990, the ICRC facility could produce fuels at the average, overall cost of \$37 per barrel of oil equivalent (Expressed in 1981 dollars).

Scientifically-controlled tests have proven the efficiency, ease of handling and environmental compatibility of ICRC products.

A test conducted in 1977 at the Georgia Power Company's Plant Mitchell, near Albany, Georgia was termed, "An unqualified success and a significant milestone in the overall objective of qualifying coal-derived fuels for a variety of future energy needs", by those involved in the test.

In 1980, a very significant test at the U. S. Department of Energy's Pittsburgh Energy Technology Center used a conventional fuel oil fired boiler. This test indicated that our solid fuels -- alone, or mixed with our liquid fuels -- can produce results nearly identical to those achieved when burning fuel oil. These tests confirm that the products of SRC-1 technology can directly displace oil in utility and industrial applications.

Our initial outreach efforts to a number of industries have been most gratifying. The electrical utility industry has expressed a great deal of interest in the potential of ICRC solid fuel; both when used alone and when mixed with liquid fuel products.

The steel and aluminum industries have expressed interest in purchasing the cokes produced by our refining processes. The glass industry, which uses large quantities of oil and natural gas, can easily adapt its present equipment to utilize the environmentally-safe and highly efficient fuels we will produce.

Furthermore, we are confident that we will be able to market the sulfur and inert ash which are by-products of the SRC-1 process.

A most significant technological milestone was reached during the past year -- the successful full development of the Critical Solvent Deashing Process. This technology, which is the heart of the SRC-1 process, separates ash from hot, molten SRC. This is the technological breakthrough which results in the overall superiority of ICRC's two stage liquefaction approach when compared with other direct liquefaction processes.

On August 7, 1980, ICRC and the federal government signed a cost sharing agreement in Owensboro, Kentucky. This agreement calls for ICRC to buy out the federal government's investment following completion of the demonstration phase of the project. ICRC will purchase the plant for its full economic value.

During the demonstration period, the federal government and ICRC will share in revenues generated by the sale of the refinery's products.

ICRC has also agreed to forego all fees which would be due it during performance of the contract. The amount of such fees is estimated to be

\$28 million. Far beyond the dollars involved is the commitment of people and talent signalled by foregoing these fees. During the design, construction and operation of the refinery, ICRC's partner companies and their divisions will assign hundreds of people and hundreds of thousands of manhours to this project.

All inventions, discoveries and patents resulting from the contract will be available for licensing to private industry. The federal government will receive 85 percent of all royalties which accrue from mandatory licensing of the technology up to the point where the combination of these royalties and the revenues from ICRC's purchase of the refinery equals 100 percent of its total investment in the project. Following this benchmark point, the federal government will receive 50 percent of all royalties from licensing of the technology up to a point where it has been reimbursed for 250 percent of its initial investment.

In January of this year the Department of Energy published a Draft Environmental Impact Statement which details the impact the ICRC facility may have on the people of western Kentucky and on the land, resources and wildlife which comprise the natural environment there. Later this month, the Department of Energy will conduct public hearings in Kentucky to receive comments on the Statement.

We welcome this opportunity for public comment, and we recognize that there are many questions which must be answered before this project is completed. Let me add that we are dedicated to answering all of these questions to the satisfaction of those who have legitimate concerns. One of the primary functions of this contract is to demonstrate that the ICRC solvent refined coal technology can be made to work in an environmentally

sound and safe manner; and we will fulfill these, as well as other provisions of our agreement with the government in our design, construction and operation of the refinery.

In summary, Mr. Chairman, let me say that when we accepted the federal government's invitation to develop and demonstrate this technology we agreed to work cooperatively with both the government and the public. We also agreed to be governed by the mandates of this kind of partnership. We at ICRC feel that thus far we have discharged these responsibilities accurately, professionally and in good faith. We will continue to do so.

Today, the United States finds itself caught up in a new effort to define and establish national priorities. What must be decided in the coming months is whether or not energy will remain one of our national priorities; whether it can be a priority one year and not a priority the next.

We at ICRC will not participate in the determination of national priorities, but we will be subject to the mandates of those determinations.

You and your colleagues in Congress will be intimately involved in establishing these priorities. We look forward to working in partnership with you, as we have in the past, as you act to determine the course of America's energy future.

We thank you for your attention and now, we will be happy to answer your questions.

INTERNATIONAL COAL REFINING COMPANY

Management of the SRC-1 Demonstration Project will be accomplished through International Coal Refining Company (ICRC) a partnership formed by subsidiaries of Air Products and Chemicals, Inc. and Wheelabrator-Frye Inc. ICRC organizational elements and key personnel are presented on Chart 1. Overall management resides with ICRC President, J. A. Pryor, with strong support from Senior Vice President - Operations, Walter T. Rector, who is responsible for the engineering, technology and manufacturing functions and Orville C. Cook, Senior Vice President - Business Management. Mr. Cook is responsible for coal supply and distribution and will direct the marketing of the products produced during the demonstration phase of the project. Almost all the other key positions in ICRC have been filled. In addition to the joint venture partners, other major industrial companies have expressed considerable interest in participating as partners in ICRC. Negotiations are now in the final stages between ICRC and Cities Service Company and Aluminum Company of America (ALCOA). It is anticipated that these two concerns will join the venture during 1981.

The Commonwealth of Kentucky is a major partner in the SRC-1 program. The Commonwealth provided the primary impetus for the SRC-1 technology, beginning in 1977 by commissioning the Rust Engineering Company to perform engineering design for a two thousand ton per day SRC-1 plant. The entire \$5 million cost was borne by the Commonwealth of Kentucky. The current federal program was based on this initiative. Kentucky has more than half of a 1,500 acre proposed plant site in Newman, Daviess County, Kentucky under option. Perhaps the most convincing evidence of the support which the Commonwealth of Kentucky is providing this project is the commitment to share in the funding of the demonstration plant through the sale of bonds whose debt service will be funded by the severance tax collected on coal mined in Kentucky. This support is estimated to total \$30 million.

PROJECT STATUS

At this time, essentially all major technology selections for the SRC-1 Demonstration Plant have been completed, and the engineering is moving rapidly. ICRC has six engineering subcontractors: Air Products,

Catalytic, CE-Lummus, R. M. Parson, Rust Engineering, and Johnson Controls (Exhibit 2). In addition, ICRC is using the services of a number of technical organizations to provide critical data supportive of the design and product utilization effort.

Selection of the Construction Manager/Constructor is imminent. Construction is anticipated to commence shortly after approval of the SRC-1 Environmental Impact Statement, now estimated to be mid-June 1981. Based on this date, the demonstration plant will be operational in late 1984.

The demonstration plant's principal product slate has been defined. An application engineering and demonstration program for the major products is proceeding, and commercial-scale product demonstrations during the operation of the demonstration plant will be used to confirm the commercial viability of SRC-1 synfuel technology.

Program Costs

This submission to the Subcommittee has also been given to the Department of Energy. The figures are not final because they do not reflect D.O.E. input and revisions; changes should be expected. A maximum of \$95 million is projected to be spent in this fiscal year. Assuming 10 percent annual escalation after this fiscal year, the total project cost through completion of start-up is estimated at about \$1.5 billion.

SRC-I DEMONSTRATION PLANT PROCESS DESCRIPTION, YIELD, AND FLEXIBILITY

The Demonstration Plant can be divided into several major process units (Exhibit 3), yielding almost even amounts of solid and liquid products (Exhibit 4). The plant produces SRC-I Solids in two forms. The "Classic" SRC Solid is made directly from the SRC Process. The TSL Solids are those solids remaining after the molten SRC Solid has been processed through the expanded-bed hydrocracking (LC-Fining) stage. Of the total plant energy output, 41% comprises 980 TPD of SRC and TSL Solids, together with 590 TPD of anode coke. Liquid output of the Demonstration Plant represents 59% of the total energy output. The liquids are actually a mix of oils from the SRC-I Process, the coker, and the LC-Finer.

SRC Coal Preparation and Dissolution

The production of SRC-I Solids and Liquids begins in the Coal Preparation Unit, which receives, unloads, conveys, stores, reclaims, dries, and grinds the coal, 93% of which is feed for the SRC Process Unit, and 7% of which supplies the Gasification Unit.

In the SRC Process Unit, the coal is slurrified in the coal-derived process solvent. The slurry mix system is designed to operate at 350°F with 38.5 wt % of 200-mesh coal in the solvent. (Since the economics of the process will be greatly enhanced by the ability to operate at higher temperature with a coarser coal, the flexibility of operating at a temperature up to 420°F with 20-mesh coal is being included.) The slurry mixture is then pumped to a reaction pressure of about 2,000 psig, mixed with a hot, hydrogen-rich gas stream, and heated first against hot returning process solvent in an exchanger, then in the fired heater to 800°F before introduction into the dissolver. The slurry heater design allows bypass of the process solvent exchanger. One of the fired slurry heaters will be able to operate at a flow velocity ranging from 12 ft/sec (design) to 30 ft/sec and accommodate slurry flows up to three times normal flow. Within the fired heater, coal dissolution is accomplished and hydrogenation reaction begins. Additional hydrogen-enriched gas is added at the exit of the fired

heater and the mixture flows to the dissolvers, where the hydrogenation and desulfurization reactions are completed. Current design calls for two dissolvers, operating in series with a total residence time of 40 min. in coal feed. Series dissolvers are preferred because it is believed individual dissolvers will be completely backmixed, which is thought to contribute to poorer solvent quality and decreased SRC yields. However, the Demonstration Plant will be designed to permit parallel operation (with piping modifications), as well as bypassing of one of the dissolvers. In addition, the amount and temperatures of hydrogen introduced at the inlet of each dissolver will be variable.

The dissolver effluent stream must be quickly cooled to below 780°F to minimize further chemical reaction. As designed, the vapor and liquid phases will be separated and each phase will be cooled. This design avoids the need to manifold a three-phase slurry into multiple parallel heat exchangers, which is potentially troublesome, or the need to quench by direct coolant injection, which is inefficient. In this vapor/liquid separation, the high-pressure hydrogen-rich gas separated from the product slurry is purified and recycled to the SRC Unit. The slurry is flashed and distilled to remove process solvent and lighter components. The remaining slurry, containing ash, unconverted coal, and SRC, is sent to a Deashing Unit for rejection of the ash and unconverted coal.

Deashing Process

Selection of the deashing technology or solid-liquid separation technique was based on an evaluation of: (1) the Kerr-McGee Solvent Deashing (CSD) Process; (2) the Lummus Anti-solvent Deashing Process; (3) operating data from both Wilsonville and Fort Lewis Pilot Plants using mechanical methods for ash separation based on centrifuges, hydroclones, and such filtration techniques as pressure leaf filters (U. S. Filter, Funda), pressure candle filters (Bergbau, Industrial), and pressure rotary drum precoat filters (Johns-Manville). Because the Lummus Process is at an earlier stage of development, and because the mechanical methods are higher in capital and operating costs, but lower

in reliability, and cannot meet product ash specifications or scale up to commercial size, the Kerr-McGee CSD Process has been selected as the base deashing system.

In the Kerr-McGee Critical Solvent Deashing Unit, the SRC-ash slurry is mixed with the critical deashing solvent and separated into a solid residue stream and a molten SRC ("Classic" SRC) stream. The solid residue stream, containing ash, dissolved coal, and 20% of the SRC, is sent to the hydrogen generation (gasification) area.

Gasification Process

Gasification serves two purposes: (1) it converts the residue into an inert slag; and (2) it generates the makeup hydrogen required for both the SRC liquefaction and the expanded-bed hydrocracking processes through gasification of the carbonaceous components of the ash concentrate plus some supplemental coal. However, this technology has not been tested in any of the coal liquefaction pilot plants, and feed characteristics will vary with the deashing process selected. Depending on the deashing technology used, the gasifier may process feed varying in ash concentration or particle size. Three entrained flow gasifier processes were evaluated rather than moving bed or fluidized bed methods because the Kerr-McGee CSD Process generates very fine particle size feedstocks. After a detailed evaluation of the (1) Texaco, (2) Shell-Koppers Presurized Gasification, and (3) Gesellschaft für Kohle Technologie (GKT)--formerly known as Koppers-Totzek Process, the GKT Process was selected because of the technical risk associated with the other processes, the lack of demonstration for the Texaco Process and the potential uncertainties in the characteristics of the ash concentrate feedstock.

Gasification is accomplished in the GKT Gasifier at atmospheric pressure by a partial oxidation of the Kerr-McGee Ash Concentrate with oxygen and steam. The resulting gas is compressed and passed over a shift conversion catalyst to produce a raw makeup hydrogen stream. After the acid gases are removed, two-thirds of the purified hydrogen stream is channeled to the SRC Unit and one-third is passed to the expanded-bed hydrocracker. After its use in these units, the recombined

gas stream is washed to remove chlorides and ammonia, scrubbed to remove acid gases in the DEA Unit, dried, and cryogenically processed to reject light hydrocarbons, which are used as a clean plant fuel. Then the purified makeup hydrogen stream is again routed to the SRC Process Unit. Acid gas removed from the treating process is passed to a Claus Unit and a Beavon Sulfur Removal Unit where molten sulfur is produced.

The recovered SRC from the Kerr-McGee Unit is subjected to three processes: (1) expanded-bed hydrocracking for conversion to liquids, (2) coker and calcining for conversion to anode coke, and (3) solidification to "Classic" SRC solid.

Expanded-Bed Hydrocracking

The LC (Lummus-Cities) Fining Process, proven in upgrading petroleum residuals, has been selected as the expanded-bed hydrocracker process. The LC-Finer operates at isothermal temperatures of 750 to 850°F and at constant pressure. The expanded bed does not plug with solids and allows continuous catalyst addition and withdrawal during operation. Process-derived solvent is fractionated from the LC-Fining product and recycled around the reactor to dilute incoming feed.

Coker and Calcining

Green coke is produced from SRC by preheating it to above 900°F and passing batches of the molten SRC into a delayed coke drum. Calcination of the green coke, containing 8 to 12% volatiles, occurs in a rotary kiln calciner at about 2500°F. This process primarily serves to reduce anode shrinkage problems and optimize the properties of the carbon anodes.

Solidification

The single product of the solidification unit is the "Classic" SRC Solid. This unit is sized to handle the entire output of the SRC process area so that maintenance may be performed on the expanded-bed hydrocracker and/or the coker-calciner units without reducing the coal feed rates to the SRC plant. Several alternatives were evaluated and considered for this solidifier system. A comparison of two indirect

process options, the Rexnord and Sandvik Belt, with the Water Bath Solidification Process resulted in the selection of the Rexnord Process. However, development efforts will continue with the Water Bath Process because it is environmentally superior.

SRC-I COAL REFINERY PRODUCT MARKETS

Product Flexibility

The Two-Stage Liquefaction (TSL) Process of SRC-I followed by expanded-bed hydrocracking can produce both solid and liquid products which will be used in most energy sectors of the economy. The production rate of liquids and solids can be varied from as little as 15% liquids with 85% solids to as much as 90% liquids with 10% solids, while producing very little gas.

SRC-I Solids

SRC and TSL Solids are significantly different from and offer definite advantages over coal (Exhibit 5). The low sulfur content (0.85 and 0.3%, respectively) results in fuels that comply with stringent New Source Performance Standards (NSPS), thus eliminating the need for scrubbing devices. In addition, such unique properties as very low ash content, low melting temperature, and very high Hardgrove grindability index enable SRC-I Solids to be used in three firing modes that are applicable to oil- and coal-designed boilers and furnaces: pulverized; melted and atomized like oil; and mixed in SRC liquid. Combustion and fuel handling tests have been conducted in an oil-designed boiler at DOE's Pittsburgh Energy Technology Center (PETC), and in a coal-designed boiler at the Georgia Power Company's Plant Mitchell Generating Station.

SRC-I Solid Burn Test: Oil-Designed Boiler. The burn test conducted at PETC was carried out with all three SRC Solid firing modes. A 100-hp (3.5 MM Btu/hr) fire-tube Johnson package boiler, designed for No. 6 fuel oil and for a volumetric heat release rate of 184,000 Btu/hr-ft³, was used in the test.

The conventional burner for No. 6 fuel oils was modified to fire the mixture and the melt forms at the full boiler capacity rating. A

water-cooled burner was used for firing the finely pulverized SRC Solid. The burner limited the heat release rate to 75,000 Btu/hr-ft³, but this rate exceeds those of the typical oil-designed utility and large industrial boilers.

Tests indicate that SRC Solid-Liquid mixtures and SRC melt can be burned at full rating in an oil-designed boiler (Exhibit 6). A combustion efficiency of 99.8% and a boiler efficiency of 81.3% for the SRC Solid-Liquid mixture were similar to those achieved when burning the reference No. 6 fuel oils. (Boiler efficiencies were determined with the heat-loss method.) Similarly, the combustion efficiency and boiler efficiency for the SRC Solid melt test were 99.2 and 82.2%, respectively. Particulate levels for SRC Solid-Liquid mixture were comparable to those obtained when burning the reference oil. SO₂ emissions for all three SRC Solid forms were within the New Source Performance Standards (NSPS) set by the EPA. Nitrogen oxides somewhat exceeded NSPS, and hydrocarbon emissions were relatively high, but this is due to the high heat release rate in the fire-tube boiler and to the fact that the test design did not attempt to control these emissions.

Results from the tests conducted with pulverized SRC Solid indicated that it too can be successfully burned in an oil-designed boiler. Because of the burner system firing rate limitations, a boiler loading of 50% was maintained during the test. A combustion efficiency of 99.4% and a boiler efficiency of 82.4% were achieved. As with the other two firing modes, SO₂ emissions were within NSPS, NO_x emissions exceeded NSPS, and hydrocarbon emissions were relatively high, again primarily because of the high heat release rate and because the test design did not attempt to control those parameters.

Thus, the PETC tests have indicated that SRC Solid-Liquid mixtures, SRC Solids melt, and Pulverized SRC Solids are feasible fuel forms for the direct displacement of oil in oil-designed boilers.

SRC Solid Burn Tests: Coal-Designed Utility Boiler. In 1977, Southern Company Services performed a large-scale test of the shipping, storage, handling, and combustion characteristics of SRC Solids at the Plant Mitchell Generating Station. The combustion test, which was conducted in a 22 MW coal-designed boiler for 18 days, successfully

demonstrated that SRC Solids can be burned in a utility boiler in a fashion similar to coal, while providing distinct advantages:

- The test revealed that after some modifications were made, no problems were encountered in pulverizing SRC Solids. One important result of the pulverizer tests was a nearly 25 percent decrease in power requirement for grinding SRC Solids.
- Emissions measurements indicated that SRC Solid complied with NSPS for SO_2 and NO_x (Exhibit 7). Particulate emission from the furnace was 1/7 to 1/10 the levels found when burning coal, and precipitators of conventional design could be used to meet the emissions standards.
- Tests indicated that after the 18-day burn, virtually no ash buildup occurred in the superheater sections. In addition, there was no need to deslag the burner front at any time during the burn test.

Anode Coke. Laboratory work has shown that SRC Solid can be processed to produce green coke, which can be calcined to a high-quality anode coke for aluminum smelting. The SRC-Solid-derived anode coke appears to be superior to conventional petroleum coke in several respects, including lower sulfur content and potentially lower power consumption during the aluminum smelting process.

SRC-I Solid Fuel Markets. A recent market analysis based on the preceding burn test results indicate that SRC-I Solids are a viable fuel for the 1990's in the following markets: oil-fired non-coal capable utility and industrial boilers; oil-fired coal capable utility boilers with technological, environmental or economic conversion problems; new intermediate load utility boilers; new industrial boilers; industrial furnaces and kilns. By the year 2000, the total energy demand in the markets for which SRC-I Solids are applicable is projected to be

approximately one million TPD of SRC-I Solids; supplying only 5% of the projected demand would require the solids output of seven SRC-I Commercial Plants. During the next two to three decades, a combination of rising world oil prices and concern about insecurity of imports will lead to a demand for clean-burning synthetic fuels which will far outstrip the capacity that this new synfuel industry will be able to construct.

The need for SRC-Solid-derived anode coke is expected to arise from the growing demand for low sulfur, low metals anode coke coupled with an expected shortfall in the production of coke from petroleum refining feedstocks. Conventional anode coke is made from petroleum coke--a by-product in the conversion of heavy fuel oil into lighter distillates. Less and poorer quality petroleum coke is expected to be available as refiners shift to heavier and poorer crudes and continue to upgrade the bottom of the barrel into gasoline and fuels.

The total demand for calcined coke in the free world is expected to increase from 5.5 MM tons in 1978 to approximately 17 MM tons in 2000. Much of this increment can be supplied by nonpetroleum sources such as SRC Solid.

SRC-I Liquids: Characteristics and Markets

An important part of the product slate from the SRC-I Demonstration Plant will be liquid distillates that can perform like those derived from petroleum. The Demonstration Plant will be producing a C_5 -400°F naphtha fraction that can be upgraded via hydrotreating and catalytic reforming to produce a high-octane unleaded gasoline blendstock; a 400-650°F cut that can be used as fuel oil similar to No. 2 fuel oil; and a 650-850°F heavy oil fraction that can be used either directly as a substitute for No. 6 fuel oil or blended with pulverized SRC Solid to form a mixture that can be fired as a No. 6 fuel oil substitute.

Since the liquid products are derived from three sources (the SRC-I first-stage liquefier, the LC-Finer second-stage liquefier, and the delayed coker), their compositions will vary, a factor that must be considered in evaluating markets. Exhibit 8 outlines the typical properties of these liquids. All SRC-I liquids have significantly

higher oxygen contents, typically 2-4% oxygen, than petroleum distillates. Nitrogen compounds are also prevalent in SRC-I liquid streams and exceed the amount usually found in petroleum fractions, while sulfur levels are equal to or less than those in similar petroleum fractions.

To produce a suitable SRC-I naphtha reformer feed for conversion into a high-octane gasoline blendstock, sulfur, oxygen and nitrogen contents must be lowered, typically to <1 ppm, to prevent deactivation of the reforming catalyst. Methods are being investigated to reduce these impurities by severe hydrotreating or a combination of extraction followed by hydrotreating. Preliminary bench-scale tests conducted with similar coal-derived naphthas have shown that a high-octane unleaded gasoline blendstock, typically with a research octane number of about 103, results from mild catalytic reforming of this naphtha once it is pretreated to remove sulfur, nitrogen and oxygen.

Because the SRC-I Middle Distillate and Heavy Oils have a somewhat lower API gravity compared with similar petroleum fuels, they may handle slightly differently from No. 2 and No. 6 fuel oils. We presently expect our Middle Distillate stream to be a good No. 2 fuel oil substitute and a stationary turbine fuel, and the Heavy Oil fraction to be used directly or blended with pulverized solids as a substitute for No. 6 fuel oil.

The market potential for SRC-I Liquids is also being evaluated in the use of SRC-I naphtha as a catalytic reforming feedstock to produce benzene, toluene, and xylene for the petrochemical industry; in the use of Middle Distillate as a hydrocracker feedstock to produce more gasoline, diesel fuel, and turbine fuel; and in the use of Heavy Oil as a carbon black feedstock. As the composition and end-use characteristics of these liquids are better defined, other markets suitable for the substitution of coal-derived liquids for petroleum will be identified.

SRC-I By-Products: Markets

Several by-products resulting from the SRC-I Process can be used to fill existing needs in the marketplace. The removal and recovery of sulfur from the coal feed permits the production of both an environmentally acceptable solid fuel, and a sulfur by-product that is

projected to be in short supply, especially in northeastern markets easily served by the Newman, Kentucky Demonstration Plant. Ammonia and carbon dioxide by-products are also expected to be produced in sufficiently large quantities in the Commercial Plant for sale to existing markets. One alternative being considered is the piping of the carbon dioxide to nearby southern Illinois or Indiana oil fields for use in enhanced oil recovery. Phenol and related oxygenated hydrocarbons, in addition to aggregate, are also by-products that can be marketed to fill industrial needs.

EXHIBIT 1

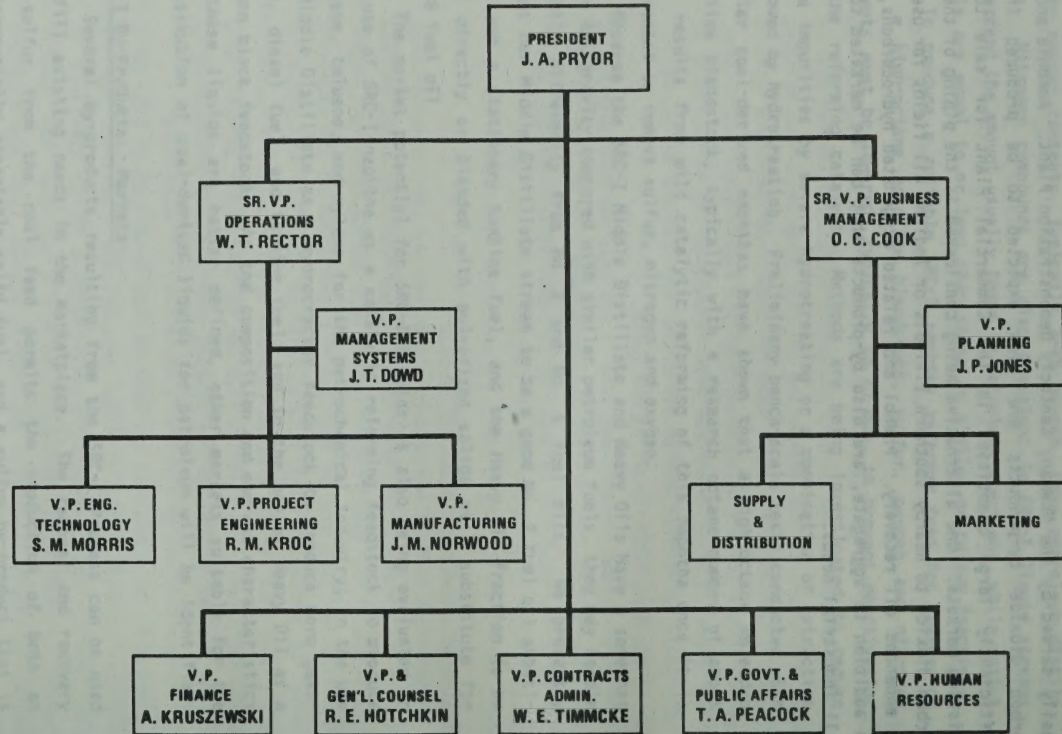


EXHIBIT 2

Major Subcontractors for the SRC-I Demonstration Plant

Subcontractor	Process Area
Air Products	Oxygen Plant Hydrogen Purification
Catalytic	Slurring, Dissolving, Fractionation, Solidification, and Deashing
Lummus	Coking and Calcining LC-Fining
Parsons	Gasification Acid Gas Treatment Compression Sulfur Recovery
Rust	Coal Preparation Offsites and Utilities
Johnson Controls	Instrument Systems
To be determined	Construction

SRC-I DEMONSTRATION PLANT SCHEMATIC

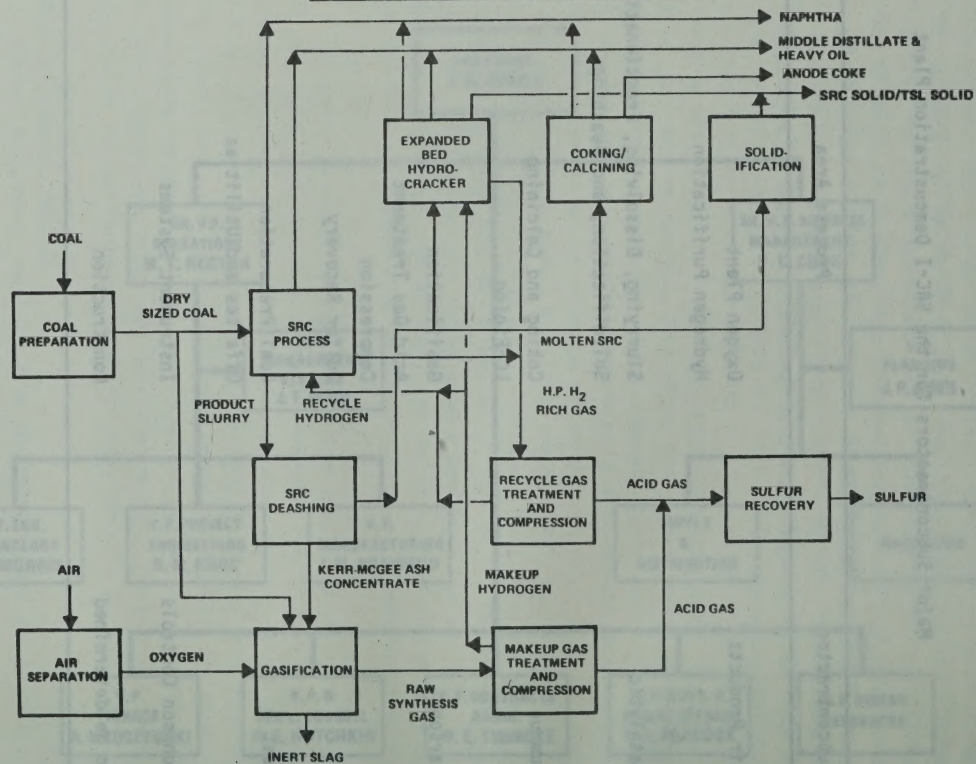


EXHIBIT 4 **NET PRODUCTS FROM SRC-I DEMONSTRATION PLANT** **AT 6000 TPSD COAL FEED RATE**

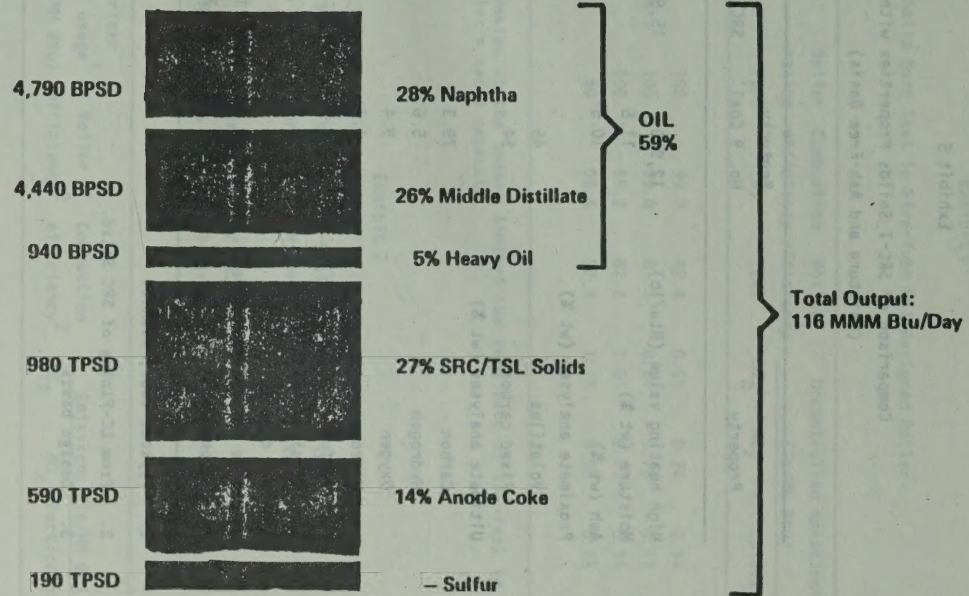


Exhibit 5

Comparison of SRC-I Solids Properties with Coal
(Moisture and Ash-Free Basis)

Property	Kentucky No. 9 Coal ¹	SRC Solid	TSL Solid ²
High heating value (Btu/lb)	12,900	15,800	16,250
Moisture (wt %)	11.5	2	2
Ash (wt %)	10.5	0.1	0.2
Proximate analyses (wt %)			
Volatiles	46	57	62
Fixed carbon	54	43	38
Ultimate analyses (wt %)			
Carbon	79.3	87	91
Hydrogen	5.6	5.9	5.0
Oxygen	9.4	4.3	1.5
Nitrogen	1.7	2.0	1.9
Sulfur	3.8	0.85 ³	0.26 ³
Bulk density (lb/ft ³)	56	32	33
Apparent density (lb/ft ³)	84	77	79
Hardgrove grindability index	59	176	176
Melting point (°F)		300	300

1. Typical coal, washed.
2. From LC-Fining of SRC Solid.
3. Design basis.

Exhibit 6

SRC Solid Burn Test in Fire-Tube Oil-Designed Boiler

Fuel	Boiler rating (hp)	Combustion efficiency (%)	Boiler efficiency (%)	Uncontrolled emissions (lb/MM Btu)		
				SO ₂	NO ₂	Particulates
No. 6 fuel oil	100	99.7	82.4	0.65	0.24	0.14
SRC-I Solid-Liquid mix	100	99.8	81.3	0.64	0.76	0.17
SRC-I Solid melt	100	99.2	82.2	1.01	0.71	0.31
SRC-I Solid, finely pulverized	50 ¹	99.4	82.4	1.15	0.98	0.35

1. The physical design of the burner limited the feed rate of the fuel to 50% of the boiler's rated capacity.

Exhibit 7

SRC Solid Burn Test in Coal-Designed Utility Boiler
Georgia Power Company's Plant Mitchell Generating Station

18-Day Firing Test of SRC Solid in a
22-MW Babcock & Wilcox Coal-Fired Utility Boiler

Fuel	Pulverizer energy usage ¹ (kWhr/MM Btu)	Boiler efficiency ²	Combustion efficiency ²	Emissions (lb/MM Btu)		
				SO ₂	NO _x	Particulates ³
Coal	0.52	90	98	1.01	0.47	0.07
SRC-I Solid	0.37	89	98.5	0.97	0.40	0.04

1. Fuel feed rate of 7000 lb/hr.
2. At full load.
3. Outlet of Electrostatic Precipitator.

Exhibit 8

Typical SRC-I Liquids Product Quality

Specification	Naphtha (C ₅ -400°F)		Middle Distillate (400-650°F)		Heavy Oil (650-850°F)	
	SRC ¹	TSL ²	SRC ¹	TSL ²	SRC ¹	TSL ²
Sulfur (wt %)	0.39	0.01	0.39	0.03-0.06	0.43	0.05-0.15
Nitrogen (wt %)	0.4-0.7	0.11	0.5-0.8	0.25-0.50	0.91	0.5-0.75
Oxygen (wt %)	1.6-5	1-1.4	3.4-4	0.3-0.7	2.4-4	0.2-0.6
Viscosity (cS at 100°F)	1	1	5	5	28	27
API Gravity	35.8	35.8	13.5	11.9	2.5	-5
Higher heating value (1000 Btu/lb)	19.7	18.9	18.2	18.2	18	17.2

1. Includes products from the SRC-I and Coker facilities.
2. Products from LC-Fining; actual values depend on reaction severity.

OPENING REMARKS

Mr. MORRIS. My name is Stanley Morris and I am Vice President-Engineering Technology, with the International Coal Refining Company. With me is Mr. Wesley Timmcke who is Vice President-Contract Administration for ICRC.

I will summarize and hit the high points of just a few important things that have happened last year since we have discussed this subject with you.

First of all, in the SRC-I Coal Liquefaction Demonstration Project we have made a lot of progress in the last year in the sale of demonstration planned production output of all types. The purchase agreement, which we can share with the committee for their information if they wish, shows that demands exceed the supply of the products that are currently anticipated being produced.

Also very important to us this year, there has been a very important test by the Pittsburgh Energy Technology Center which is part of the DOE in which they have taken solid SRC and fired it in a package boiler which is designed to fire only oil and they have achieved efficiencies and operability essentially equivalent to that of oil itself. We have been able to demonstrate really for the first time in a scientifically important way the solid product which is about 31 or so percent over our total output. You may recall that our plant produces about 39 percent and about 31 percent solids. This solid product is usable in many kinds of oil-fired boilers.

Mr. YATES. How much of a burn do you get on the solid one?

Mr. MORRIS. The burnout is well in excess of 99 percent.

Mr. YATES. Is it?

Mr. MORRIS. Yes, and that is quite surprising—expected by some and not by others.

Mr. YATES. Does this have anything to do with the need for magnetohydrodynamics? They are trying to reach a burn of 65 percent, I think.

Mr. MORRIS. Well, with magnetohydrodynamics they are firing coal, of course, and not SRC.

Mr. YATES. I thought you talked about a solid. Isn't that coal?

Mr. MORRIS. Yes, but the solid we are referring to is a product from our plant which is essentially ash free and essentially sulphur free.

Mr. YATES. I see. In other words, you have a perfect unit.

Mr. DICKS. What about the economics? You say you are in a position now to sell the output from your demonstration plant.

Mr. MORRIS. Right.

Mr. DICKS. What are the economics?

Mr. MORRIS. Well, the arrangements that we have with our customers vary, of course, from customer to customer but they are intended to make the products available to the customers at the alternative price available from foreign oil based sources to them at the time of sale which is, of course, several years from now.

Mr. DICKS. Are you making any money on that basis? Is it costing you more to develop it that way?

Mr. MORRIS. Sir, the major uncertainty associated with your question is the cost of foreign oil. If the price progression of oil in the next five years is remotely like the price progression that it has been in the last three, then the answer to your question is quite

positive. If it goes in some other direction, of course that is the major risk involved in these projects.

Mr. DICKS. Mr. Reagan says we don't need those progressions any more, we can go immediately to commercialization with joint ventures and loan guarantees and we don't need these demonstration programs because the market system can handle all that. Do you agree or disagree with that?

Mr. MORRIS. No, I certainly do not. These demonstration plans are being built at a time when the technology is evolving at a very, very rapid rate. The total technical risk is reasonably sizable relative to the technical risks that private corporations have historically taken in the past. Any attempt to place on the private sector the responsibility for developing these technologies or certainly the entire responsibility for developing these technologies is likely to lead to a failure to have the technologies to develop them at all. They have hundreds of trained people with many years of established work. All of this could very easily go down the drain.

Mr. YATES. There is the fact that as an investor the company might want to spend only five or ten million dollars to try to get a well, as opposed to spending a billion dollars or more to get a plant.

Mr. MORRIS. Private companies like ourselves have really made over the years very substantial financial commitments to these programs relative to our sizes. We have made a very sizable investment in research personnel and commitment.

Mr. LOEFFLER. Can you back that up with numbers?

Mr. MORRIS. From its parent in the last three years built up a team of about 600 professionals who are currently trained and experienced in direct hydro liquefaction of coal. If we were to lose that group through any mechanism, we will have a loss several years and in fact irreplaceable resources for the Nation.

Mr. LOEFFLER. How much money has your company personally put into that project?

Mr. MORRIS. I don't have the exact numbers but it is in the tens of millions of dollars over the last few years.

Mr. YATES. What would happen if we followed Mr. Reagan's suggestion and eliminated the funding in the new budget for the project?

Mr. MORRIS. Well, our company is certainly dedicated to finding ways of pursuing this technology but I think the most likely situation is that we would see at best a substantial delay in the program.

Mr. YATES. How much time?

Mr. MORRIS. It, of course, depends on what happens but it is hard to see anything in less than a year but maybe more. Let's say a year for sake of illustration and discussion. A year's delay in our program, depending on how it was done, would result in a loss of momentum at best very possibly. Depending on the nature of the delay we would lose a significant part or maybe even all of the resource base and people that we have built up.

Mr. LOEFFLER. If you were to have that delay from where you are today until you get operable what is the end result? When you begin producing and conducting this pilot program what are you looking at?

Mr. MORRIS. I am not sure I really fully understand what you are asking.

Mr. DICKS. In other words, when they get their full demonstration project in place—

Mr. LOEFFLER. This would cause you a year's delay. What is the final ripple effect?

Mr. MORRIS. The number, for sake of discussion, would have a far more serious effect. If the year's delay resulted in our private entity which formed the ICRC organization, deciding to recall people, to work on totally private businesses which are all very strong or if some of the key people themselves decided to go elsewhere, then just re-establishing that team could result in several years' delay.

Mr. YATES. May I follow up on that question?

Mr. LOEFFLER. Yes.

Mr. YATES. How many companies are there in ICRC?

Mr. MORRIS. Well, sir, there are two companies which currently have 50 percent of the ICRC and those are the Air Products and Chemicals, Inc., and Wheelabrator-Frye, Inc. In addition, ALCOA and Cities Service are very likely to become minority investors in ICRC.

GOVERNMENT FUNDING

Mr. YATES. How much government funding do you receive?

Mr. MORRIS. Right now the contract provides for the funding of our program through the construction and operation of the facility other than the private sector share which is \$90 million from ICRC and about \$30 million from the Commonwealth of Kentucky.

Mr. YATES. I was trying to find out what the effect would be if the government funding were to stop. I want to ask you what the effect would be on the contract. If funding stops, will there be a lawsuit against the government? That is point one.

Point two, would the companies that make up your group, which consist of some of the largest companies in the country, be able to make up the difference in order to go ahead?

Mr. MORRIS. Well, I will answer the second point and maybe Mr. Timmcke will address the first.

Complete abandonment of the DOE responsibility for carrying out this program or the government responsibility for carrying out this program would result in an inability of our companies or I suspect, sir, any questions from the private sector of carrying this program out.

Mr. TIMMCKE. I would like to take a minute to explain our contractual relationship with the Department of Energy. The contract basically provides for us to build a demonstration plant with so many tons a day to prove that it is feasibly economically viable and environmentally acceptable. I have no doubt that we can produce a plant that is technically feasible and I have no doubt that we can make it environmentally acceptable, though I do have some doubt as to whether it will be economically viable.

Mr. YATES. You say you can do this with your own funds?

Mr. TIMMCKE. No, not with our own funds but in cooperation with the government which does provide the contract with a substantial DOE funding. The real risk here is the economic viability because we do not have control in the marketplace or we do not have a substantially stable marketplace. We are greatly dependent

upon foreign oil which is selling at a price that is considerable among its production costs.

We could be entering into this and develop a plant that was fully economic on the basis of the data we have today but a reduction in the world price of oil could make it so that it was no longer economically viable and that is a risk that the partners of ICRC cannot take. However, it is a risk that the taxpayers of the country can take because continuing on an energy independence type program may have the effect, if nothing else, of keeping the foreign oil prices in line and the amount that could be saved in only a few short months would more than pay for the plan. I believe that if foreign interests are aware of the fact that we are backing away from our attempts to become energy independent that the chances of our ever becoming energy independent are absolutely nil.

Mr. YATES. I take it from your testimony that you don't agree with the testimony of Mr. Stockman and Mr. Reagan that we ought to stop government funding?

Mr. TIMMCKE. There is not enough money that I can see in any of the companies that would be involved in these kinds of programs that they could fund it by themselves with the amount of market risk that exists today.

Mr. YATES. Did you want to ask a question, Mr. Loeffler?

Mr. LOEFFLER. We have spoken about the direct impact on the major competition in the area in the macro sense. What would be the macro effect of the entire synthetic fuel industry if something happened to your project?

Mr. MORRIS. Maybe the best way to discuss that, Mr. Loeffler, is again to talk about the resources that have been developed. The companies that many of our resource people have come from have large established, viable ongoing businesses in many areas in which the people that have been trained to be experts can be deployed.

The loss to the country of a group of several hundred professional, highly trained individuals in the field of coal liquefaction, which has taken literally years to put together, would be very substantial. There are only perhaps a handful of numbers to count on the fingers of one hand, groups of this type in the entire Nation, that can carry forward programs in this field today and if we as a Nation turn our back on the need to have a synthetic fuels industry in the future, then these groups will rapidly disperse. If we decide six months from now or a year from now or two years from now that we again need a synthetic fuels program, we are back to the beginning.

Mr. DICKS. Would the Chairman yield for just one point?

Mr. YATES. Sure.

Mr. DICKS. I am concerned about the Administration's position as well. You can qualify under the loan guarantees or somehow be taken care of. Would you be able to make a commercial commitment with the Department of Energy at this time without going ahead and demonstrating this technology?

Mr. MORRIS. The intent of the SRC-I and, for that matter, the SRC-II demonstration plants was to develop a single co-sized commercial train of what would be a large scale 30,000 nominal tons a day commercial facilities. The reason the large scale 6,000 ton train

was chosen by DOE initially and the reason why we and others felt that was the appropriate size was to make it possible for a vast segment of private industry to be able to approach the financial markets, the lenders' markets in the future and to ask for funds to partially finance the 30,000 tons a day plant.

We are trying to reduce the technical risk of going to commercial facilities to absolutely minimum. If we went to either a smaller plant or if we somehow changed our schedule, what we would end up doing is adding a number of years to the time when commercial facilities could be available.

Mr. DICKS. Could you qualify under the synthetic fuels bill for a commercial arrangement? Would you qualify?

Mr. LOEFFLER. That is your contract apparently with DOE and through the qualification—of that contract.

Mr. MORRIS. It is not altogether certain. Of course the Synthetic Fuels Corporation currently exists as an act of Congress only. There are no rules, only the guidelines of operation. The rules by which that organization will conduct itself have not been promulgated.

Mr. YATES. You don't know whether the organization will continue?

Mr. MORRIS. That is exactly right.

Mr. YATES. The present head of the office came into office saying he was going to disband the organization so you don't know where you are going right now.

Mr. MORRIS. It is very difficult to analyze.

Mr. YATES. It is extremely difficult to analyze both with respect to knowing whether the organization which works with you would continue to exist and whether you will have any funds.

Mr. TIMMCKE. This is one of the major problems we have, of course, in evaluating whether we can qualify them. There is no history from which to determine what the rules and regulations will be.

I want to make one significant point here which is that while we need government assistance during this period when we are building the first demonstration plant, it is very much our intention—as a matter of fact, I would not be involved in this program if it were not for the fact that our intention is to take on commercialization. We need the government assistance now because we are demonstrating the capability of this plant to the financial institutions that will finance the continuing commercialization.

Just one more point. While we are putting in taxpayers' money in 1981, 1982 and 1983, by 1987 and 1988 that money is going to come back to the Treasury because the contract provides for us to buy out the facility, it provides for us to license the technology worldwide and to share that license fee, 85 percent to the government, until they have returned 100 percent of their investment and to continue with 50 percent revenue sharing until they have gotten 250 percent of their investment.

Mr. YATES. Why is the administration against this wonderful approach?

Mr. TIMMCKE. That beats me.

Mr. YATES. Any other questions?

Mr. McDADE. I know at this point these are perhaps guesstimates and not estimates, but would you give me the range which you believe you could produce the synthetic product? I don't think we have that in the record. I am uncertain what the figures are currently. Can you give me your best estimates?

Mr. MORRIS. Our most recent estimates of this are that a commercial facility of 35,000 tons a day operating, say, in 1990 would produce products from our type of facility at about \$37 a barrel in today's dollars. That is not 1990 dollars but today's dollars. That is our most current estimate.

Mr. McDADE. I don't have any more questions.

Mr. YATES. Thank you very much for a very interesting presentation.

I want to apologize to the other witnesses but obviously these are important subjects and important questions and the committee is grateful for the opportunity to have the witnesses here and answering the questions.

Mr. MORRIS. Thank you.

[Answers to Mr. Loeffler's questions on SRC-I follow.]

RESPONSE TO CONGRESSMAN LOEFFLER'S QUESTIONS ON SRC-I

Question. Has ICRC considered the option of reducing the size of the plant to 2,000 tons per day, which was the original design configuration? What would the cost and schedule implications be of such a change?

Answer. The 6,000 ton per day size allows optimum economies of scale in the design and operation of the plant and in the marketing of the plant products. A smaller plant would not cost proportionately less to build and operate. Many costs would remain fixed. For example, design and engineering costs and the costs associated with operating and maintenance labor would remain about the same for a smaller plant.

Because of these fixed costs, the cost of building and operating a 2,000 ton per day plant would be approximately 35 percent less than the cost of building and operating the 6,000 ton per day plant. However, the decreased product output of a 2,000 ton per day plant would make commercial marketing of the plant product economically unfeasible. The small plant would produce only about one-third the product of the 6,000 ton per day plant—not enough to satisfy customer needs or guarantee a reasonable return for the federal government and ICRC on their investment.

The SRC-I contract calls for ICRC to buy out the government's share in the plant following the demonstration period for a price calculated to equal the full economic value of the plant. Because a 2,000 ton per day plant would not allow commercial marketing to proceed, the economic value of such a plant to ICRC would be \$0. A 6,000 ton per day plant, however, would have an economic value of several hundred million dollars for ICRC because this size plant provides enough product for commercial marketing.

Thus, while a 2,000 ton per day plant would result in an initial reduction of approximately two-thirds the amount of the federal government's investment, the government could never hope to recover its investment through the initial contract agreement.

There is the additional possibility that a scale-down to smaller plant configuration would cause delays and the inflation of costs associated with these delays. Strictly speaking, a smaller plant could not be engineered merely by reducing the design and engineering configurations developed by ICRC thus far. In essence, a scale-down would necessitate additional new engineering design work which would move the project off schedule.

Question. What would be the impact of terminating the DOE demonstration plant program, not only with regard to your project, but also with the development of the synthetic industry?

Answer. The synthetic fuels programs that are now ready for commercialization by the Synthetic Fuel Corporation essentially would concentrate the location of synfuel plants in the Western part of the country where projects must contend with limited water supply and difficulties transporting products to the Eastern marketplace. These technologies that are ready for deployment and need only financial incentives to proceed to production are primarily limited to oil shale deposits and

mildly caking coal deposits in the West. High-sulfur Eastern coal, perhaps one of the single most abundant domestic energy resources, cannot be used by the processes now primed for commercialization.

In addition, Demonstration plant technologies, planned in the East, develop a direct liquefaction process that yields approximately $\frac{1}{3}$ more energy from the same amount of coal than the indirect liquefaction technology that is now available for commercial development.

Terminating DOE demonstration project not only would severely set-back programs that utilize the most abundant energy resource nearest the greatest number of customers, but such action also would curtail development of the most efficient and flexible of all technologies.

Question. What are the direct and indirect employment implications of such a plant?

Answer. According to the most recent figures, peak employment of approximately 2,600 workers is projected in June, 1982. The estimated average wage of a construction worker will be \$11.75 an hour (1979 dollars), totaling \$24,500 a year per worker. Approximately \$110 million dollars will be paid to the construction workforce, with respending of the initial payroll totaling approximately \$103 million in induced local incomes.

In addition, about 2300 indirect jobs would be attributable to the construction phase of the plant.

During operation, approximately 725 people will work directly in the plant including contractor service workers and salaried personnel. The average salary for non-supervisory positions will be \$18,250 (1979 dollars). Supervisory personnel will average \$22,500 annually (1979 dollars).

Operation of the demonstration plant is expected to indirectly open nearly 500 new coal mining-related jobs.

Question. How strong is the market for solid SRC and what type of commitments or demands are being made for this project?

Because of the "demonstration" nature of the plant, utilities and industries would not be expected to make future market decisions based solely on the limited output expected from this single project. However, there is certainly no lack of interest on the part of potential synfuel users regarding the SRC-I project. Quite the contrary, several utilities and industries, anticipating a significant synfuels market in the 1990's, have agreements with the International Coal Refining Company to purchase the products for testing in their own boilers or industrial processes.

These include such companies as New England Gas & Electric Association, which recently signed an agreement to purchase between 15 and 35 percent of the solid product during demonstration operation, Central Hudson Gas and Electric of New York, and Southern Company's Georgia Power Company. From the industrial sector, participants in the product demonstration and purchase program.

Together, agreement to purchase the clean-burning solid product from the demonstration plant actually exceed the supply currently anticipated. Furthermore, several of the firms have also requested a first option on the output from the first commercial SRC-I plant, and if these options are exercised, all of the first SRC-I products would already be committed.

GULF MINERAL RESOURCES COMPANY

DOE—SRC-II DEMONSTRATION PLANT

WITNESS

R. A. FLINN, VICE PRESIDENT OF DEVELOPMENT, SRC INTERNATIONAL, INC.

Mr. YATES. Gulf Mineral Resources Company, Mr. Flinn.

Mr. Flinn, your statement may be made part of the record.

Mr. FLINN. Thank you.

[Material follows:]

TESTIMONY OF RICHARD A. FLINN

Mr. Chairman and Members of the Committee, we are here representing SRC International, Inc., prime contractor on the SRC-II Demonstration Project. I am R.

A. Flinn and I'm the Vice President of Development. SRC International is a joint venture owned by the Pittsburgh & Midway Coal Mining Co. (a Gulf Oil Corporation subsidiary), Ruhrkohle A.G., and Mitsui SRC Development Company, Ltd.

Significant progress as well as some delays have occurred in the SRC-II Project. Several important steps forward in the past year were:

An international agreement to share the cost and the returns from the Project was reached among the Governments of the United States, West Germany, and Japan.

A cost-sharing agreement was reached between DOE and SRC International, Inc., which became the prime contractor.

A process design firm, Badger Energy, Inc., was engaged as a subcontractor to convert the conceptual design available at the start of 1980 to a final design basis for the Plant.

DOE-supported work at other industrial laboratories has shown that SRC-II's primary product, which is useful as a fuel oil by utilities and industry, can be further refined by modified petroleum processing methods to produce high quality gasoline, jet fuel, and home heating oil. The costs of further refining are estimated to be comparable to similar refining of petroleum.

Preparations for construction activity have begun with work proceeding on the 25 required permits and the selection of the construction management subcontractor, a joint venture of M. W. Kellogg and Kaiser Engineers.

Preliminary negotiations have been conducted with the prospective suppliers of coal to the Demo Plant. The coal will be purchased for the Project from firms not participating in the Project.

A Draft Environmental Impact Statement was made public in mid-1980, public comment was received and considered, and a Final Environmental Impact Statement prepared by DOE with our support is expected to become a matter of record soon.

The possible health effects of the coal liquefaction products continue to be actively studied by laboratories that are part of the support program. Those health effects which have been observed are similar to effects noted in past years for coal-derived fuels and chemicals. At the present it is believed these effects can be controlled by handling the products carefully, as similar fuel products are to be handled in related industries. The health experience of the pilot plant and laboratory workers involved in SRC continued to be good in 1980 because of the handling and monitoring procedures instituted at the outset of the SRC efforts some years ago.

The electric utility group that is expected to participate in the demonstration program now consists of 16 members. This group plans to use the principle product, SRC-II Fuel Oil, to replace low-sulfur petroleum fuel oil and to pay to DOE a premium over the market price for competitive fuel oil. This utility group also plans to absorb the extra costs of developing product handling and use information. There is also a group of industrial plants that plan to test SRC-II Fuel Oil from the Demo Plant in industrial boilers, turbines, and diesel engines.

Budget concerns in the United States and West Germany have caused uncertainty as to the funding that will be available to the Project. We believe that demonstration of direct coal liquefaction in a timely manner is strategically and economically important. This first-of-a-kind plant involves substantial risk. The primary initial product from SRC-II would be a quality fuel oil that could displace important oil needed for many existing oil-fired utility and industrial boilers. The primary SRC-II products could be refined to produce transportation fuels, including high octane gasoline and jet fuel. By converting the abundant high-sulfur eastern bituminous coal to SRC-II oil, the United States could improve both its economic and strategic positions.

Delays have been incurred at this early stage of the Project because of certain design changes required for safety, environmental, and operating reasons, because of a slowing of the Environmental Impact Statement, and because of the restraining pace of Federal Procurement procedures. At the present the completion of plant construction is projected for mid-1985 compared to the earlier target of late 1984.

Design changes, inflation and delay will result in substantial cost increases. Updated cost estimates are being prepared now, but a good estimate of plant cost will not be available until the project baseline is completed in mid-1982. In the meantime, recognition that cost increase is likely has led DOE, the foreign participants, and SRC International to an investigation of means to control costs within the original budget.

SRC-II

Mr. YATES. Are you connected with synfuels in any way?

Mr. FLINN. Yes. The organization that I am with is responsible for the SRC-II project.

Since we did submit our testimony for the record we thought that if it is agreeable to you we would just answer your questions.

Mr. YATES. Just answer questions?

Mr. FLINN. If that is agreeable.

Mr. YATES. I see. You are one of the contracting parties on SRC-II then?

Mr. FLINN. That is right.

Mr. YATES. How would you be affected by the budget announcement by Mr. Reagan? Do you have any idea yet? Have you made any inquiry?

Mr. FLINN. We have made inquiries. It is very difficult for us to say at the moment how it would affect the proposal that has been made that we should switch over to the Synthetic Fuels Corporation and we have not had the time to determine how that might be done.

Our problem is that we immediately see a number of hurdles, and since it has not been done before we are concerned that the transition might not be effective.

Mr. YATES. What hurdles do you foresee? Can you give us some examples?

Mr. FLINN. This is a demonstration plant of noncommercial size. As we see it the Synthetic Fuels Corporation is set up to provide financial support for commercial ventures which have the prospect of making some money in the size that they are built. That is not true of the demonstration plants. The demonstration program, including SRC-I and SRC-II, was conceived as a very large attempt to show that it could be done on commercial scale equipment, and thereby to say perhaps 10 years, so that industry could then build the plants in 1985 or 1986 or 1987 rather than the late 1990s.

We are not sure that we fit that commercial mold. It has been proposed that we might get the joint venture mold which I believe is fifth in order of priority among the options the Synthetic Fuels Corporation will have. That requires 40 percent private funding. Further, it has been suggested that the Department of Energy's foreign partners—that is, the government in Germany and the government in Japan—would provide that 40 percent but we know that they regard their partner as the United States Government. I think what was signed with the Department of Energy and was signed by the ambassadors of those two countries and is regarded as an international agreement akin to a treaty rather than a contract to us and for them to provide the money to a private organization is not very attractive to them.

Mr. DICKS. Isn't it true, that similar to the SRC-I and SRC-II projects the government has a right to recover the investment?

Mr. FLINN. Exactly. The formula that was described by the previous group is the same formula essentially that we have.

Mr. DICKS. Why are the German and Japanese governments supporting the SRC-II project?

Mr. FLINN. Well, it is really an international recognition that coal can be converted to oil and provide a lever against OPEC oil and the Germans and Japanese of course find themselves more controlled by that situation than even we are. They have in Germany abundant supplies of coal. Japan has abundant supplies of coal available to it in addition to some domestic coal that is sub-

stantial and they would hope that this technology could be used to relieve the pressure from them.

Mr. DICKS. Would this not cause a serious U.S. foreign policy question if we broke this off?

Mr. FLINN. I am not very expert in that area but that is my impression. They have been very concerned.

Mr. YATES. The Reagan Administration does not want to break off the agreement. As I understand this, what they have proposed is a switch over from the Department of Energy to Synthetic Fuels Corporation.

Mr. FLINN. That is right.

Mr. YATES. So that the contract would still exist.

Mr. DICKS. There is a question whether they would qualify because, as the gentleman has mentioned, you might have to do it possibly under a joint venture agreement and there is a question whether this is commercially viable.

Mr. YATES. The point is that there is no indication that there is any intention on the part of our government to break it off. As I understand the Reagan proposal, it is to have the contracting party—which you say it is not, it is the government—move the agency from DOE to Synthetic Fuels Corporation. I don't know whether this would require new legal amendments to your contract. I assume it would and that might slow you up for a while, might it not?

Mr. FLINN. It took about a year for DOE to work out the arrangements with the German and Japanese governments and I am sure that with that in place it will take at least that long to work out an arrangement whereby if they are willing at all the Germans and Japanese will enter into such a different flow of funds. As I indicated, they felt very comfortable with the funds flowing through the United States Treasury. They specifically were not enthused about the prospect of putting them into the venture through our industrial firms, either the German or Japanese industrial firms. The original proposition was that they would provide the government money from Germany through EURCO and similarly in Japan but that was not acceptable to those governments. They wanted to deal on an international agreement basis with the United States Government. It may be doable but it will take a considerable period of time and certainly not this fiscal year.

Mr. YATES. Mr. Dicks.

Mr. DICKS. If the SRC-II project is successful, what is the likely result?

Mr. FLINN. If it is successful, we believe that a number of SRC-II plants could be built in the Appalachian area particularly to supply fuel oil and refinery feed stock to the eastern seaboard. It can be done in the longer term with western coal but your immediate objective is the large high sulphur eastern coal supply.

Now there are about two million barrels a day of oil imported from Maine to Florida, most of that to run electric utilities and industry. That is split about half and half between industrial boilers and utility boilers and the objective of this program is to accelerate the time back into the latter part of the 1980s when that two million barrels a day could be replaced by oil from coal. We believe the leverage in carrying on a demonstration, the economics

is very substantial and we believe there is a strategic benefit to having this as one of our solutions to the imported oil situation.

Mr. DICKS. Mr. McDade asked a question concerning the price per barrel. What is the estimated price per barrel for SRC-II?

Mr. FLINN. We have estimated \$35 to \$40 a barrel but I would emphasize that that is based on the assumption that the demonstration works as it is conceived and to enter into the demonstration on the assumption that you can produce oil at that price ignores all the risk in getting it done at the right deficiency and with the plans that you have.

Mr. YATES. Mr. Loeffler, do you have any questions?

Mr. LOEFFLER. No.

Mr. MCDADE. What is the limit that you are putting out for this project?

Mr. FLINN. The cost sharing contribution of the consortium that we have is \$100 million. Now that is \$25 million that is spent by EURCO and Gulf Oil between 1974 and 1978 to establish conceptual design. It is \$25 million.

Mr. MCDADE. That is all your own money?

Mr. FLINN. Yes.

Mr. YATES. That R&D is basically your money?

Mr. FLINN. Yes, \$25 million that was flowing to the project this year in the form of a site that we have purchased for \$8 million, \$9 million and cash so that that \$50 million is front end contribution by this group of companies. Another \$50 million then when the plant is built and we are trying to start it up. The belief of everybody, I think, is that there will be a starting up of a demonstration plant since it is the first of a kind so we would share with the Department of Energy under the present contract dollar for dollar the first \$100 million of modifications necessary to make that plant work.

Mr. MCDADE. It is my understanding that newly discovered oil in this country is selling for \$35 a barrel now, U.S. price. Is that a correct statement?

Mr. FLINN. That is the rate, yes.

Mr. MCDADE. Let me ask you the question that I hear when I discuss this with the OMB. They will say that you ought to do it; you have done the basic research. The current price of newly discovered oil in this country is \$35 a barrel. Your estimated ranges are in that same range and you are going out to 1990 for product delivery. We certainly don't know what the price of oil is going to be in 1990 but I think we would all be utterly naive if we said it would be below \$30. Why can't you commercialize it yourself?

Mr. FLINN. It is the risk that you take.

Mr. MCDADE. You take a risk when you drill a hole?

Mr. FLINN. Yes.

Mr. MCDADE. About one hit in ten?

Mr. FLINN. We are doing better than that.

Mr. MCDADE. What is your ratio?

Mr. FLINN. Well, you have to distinguish between exploration wells and production wells but when you average them all it is more like three or four out of seven but in any case you know where it is. It is when you don't know where it is that it is a risk.

Mr. McDADE. Let's call it exploratory because that is more analogous.

Mr. FLINN. The dollar magnitude of the risk there is vastly different. Our offshore laboratory spent \$100 million to drill a well but we are talking about a gigantic experiment costing \$1.5 million with the potential return in the 1990s after you have invested three or four more million dollars.

Mr. DICKS. What if we purchase it?

Mr. YATES. Let him answer Mr. McDade's question.

Mr. FLINN. Any company sets up its capital budget in the series of prospects with the high risk to the bottom. We have about 70 to 80 percent of our budget that goes into drilling holes. We have the uranium mines, coal resources and reserves that have to be developed. We have a large shale project underway that is fair to risk and then we come to something like this and it is the judgment of our organization that we are willing to put up \$100 million but not \$1.5 billion. Our shareholders would regard us as irresponsible at this particular point in time.

Let me go further to say we believe direct liquefaction is a very important thing for the country to develop and that it will have to in time. In time it will have to. Our prognosis of that is that it would happen in the latter part of the 1990s. If this program is not supported, Gulf and EURCO will not abandon it, we would continue that type of work.

Mr. McDADE. It is the R&D time?

Mr. FLINN. Yes, it is the time objective of the demonstration program.

Mr. McDADE. Can you give us the time frame when you think that might occur?

Mr. FLINN. Our judgment has been, and that has to be qualified by anything you can think of to qualify it, ten years. How do we arrive at that sort of thing? By looking at the projections of the availability of crude oil in this country and in the world as compared with the demand considering all the factors that seem to be at work now.

Mr. McDADE. So your testimony is what it really gets for the input of the dollars and sharing of the risk with you is a collapse at that time to 1990.

Mr. FLINN. Yes. We are seeing the latter part of the 1980's if the demonstration works.

Mr. McDADE. What is your most optimistic date?

Mr. FLINN. The demonstration will take to about 1987 as we see it. At that point it should be relatively clear whether we have been successful and we expect success so we could be building those plants in the 1980's, producing in the 1990's whereas it is about a decade later. It is very clear to us that the world supply of oil about the year 2000 will begin to fall below the demand considering all of the developing nations as well as our own.

Mr. YATES. If the government support is withdrawn, as may be suggested, and your group decides not to go forward as quickly as you would under the present time, are there other groups that are competing with you or are likely to go forward and spend the money in developing these kinds of plans?

Mr. FLINN. There are four direct liquefaction processes being developed in this country right now which two of them are at the demonstration stage and that is SRC-I and SRC-II. The names are very similar but the products produced are significantly different.

The other processes are the Exxon process which is in the pilot plant stage and similarly a Japanese process. Now Exxon recently has said that they expect to commercialize, other things being equal, their process in 1997 and that tends to coincide with our view that unless there is something like a demonstration that enables the acceleration this will come along but perhaps a decade later.

Let me just dwell for a moment on what the demonstration program is. We are demonstrating SRC-II but a direct coal liquefaction plant is a large machine with a heart that could be the Exxon process, it could be the German process, it could be SRC-II, and that was the concept, that DOE had to have a number of pilot programs and few demonstration programs into which these various pilots could fit. This will broaden the application of the technology. German technology obviously is designed to fit German coal. They would take this machine, place it in a hearth and away it would go and similarly with Japan. The whole demonstration program lacking a demonstration becomes a series of experiments, a series of plants which will mature in the latter part of the 1990s.

Mr. YATES. Is there any chance of that being expedited without government help?

Mr. FLINN. We don't see any way that our project could go forward on the scale that is required without substantial government involvement.

Mr. YATES. Did any of the OMB officials or the President's office confer with you before the announcement was made by OMB?

Mr. FLINN. They conferred with the Department of Energy. We were unable to get an appointment.

Mr. YATES. Do you know whether they conferred with the governments of Japan and Germany?

Mr. FLINN. Yes, they did and particularly with Japan but also Germany. The Japanese government, I understand, made it very clear that they wanted the project to continue. After all, they signed an international agreement last July and they feel that perhaps they were misled.

Mr. YATES. What about Germany?

Mr. FLINN. Yes, Germany has been in touch with Mr. Edwards and the Japanese as well. I believe the Japanese also went to the State Department and I understand the Germans did, too.

Mr. YATES. Have the Germans and the Japanese been in touch with you and your company?

Mr. FLINN. Yes, we have German and Japanese firms working with us and I met with them as recently as yesterday.

Mr. YATES. Are you trying to persuade the Reagan administration of the necessity of your project?

Mr. FLINN. Yes, and I believe that they have accepted that. They have proposed that if it is funded in a different way, the Synthetic Fuels Corporation. The question is whether it can be done.

Mr. DICKS. Talking about the necessity of being able to find lending institutions and capital markets to make these kinds of

large investments, could you do it if you had a purchase agreement with the United States Government? In other words, if the United States Government said it would purchase the output of this plant, which would guarantee you a market with the Strategic Petroleum Reserve or the Department of Defense would that make you more willing to proceed?

Mr. FLINN. It simply would not work very well.

Mr. YATES. Explain to me why it would not work well.

Mr. FLINN. Too small to be economic.

Mr. YATES. Why?

Mr. FLINN. You have disproportionately high capital and operating charges so the product from this plant, and this is a very rough estimate year, is a couple years doubled, a period two and a half times the cost I mentioned, the \$35 to \$40 a barrel, so that you would have essentially an uneconomic situation if the government guaranteed to purchase the product.

Mr. DICKS. Would it be an economic problem?

Mr. FLINN. It would be on the order of \$100 a barrel and that would have to go on for a long period of time to pay out the plant.

Mr. DICKS. How large a plant would you need in order for it to become economic, 6,000 tons a day?

Mr. FLINN. Five times as large, 30,000 tons a day. As it was pointed out earlier, the price keeps changing and the price of oil has gone up one and a half times, one and three-quarter times since we made that judgment. I believe that the size of plant needs to be economic, assuming it works, is coming towards 6,000 tons but it is still two and a half times to three times that large so that an investment in a plant to that size right now with the risk involved, you have been talking about \$3 billion, \$4 billion on the chance that it might work. This can't be done.

Mr. YATES. Any other questions?

Thank you very much, Mr. Flinn.

Mr. FLINN. Thank you.

[Answers to Congressman Loeffler's question on SRC-II follows:]

RESPONSE TO CONGRESSMAN LOEFFLER'S QUESTION ON SRC-II

Question. Will the overall progress of the project continue at the present level without government funding?

Answer. No.

Question. What are the advantages and benefits to the government and the country of the present project funding and management structure?

Answer. The main advantage is continuity. There are some disadvantages, however. Annual funding makes uncertainty a constant problem with staff and subcontractors. Federal Procurement and management procedures cause delay, attendant cost increases, and occasionally lead to a situation wherein proprietary processes needed within the Project are obtained only with great difficulty, if at all, because of Federal requirements for public availability of information or rights.

Question. OMB is proposing to rescind your funding for FY'81. If they rescind the funds and at some later date restore them on some other basis, what would be the effect?

Answer. Recision of FY'81 funds will cause an intolerable interruption of the Project which is almost certain to result in termination.

THERMO ELECTRON CORP.

DOE CONSERVATION PROGRAM

WITNESS

GEORGE N. HATSOPOULOS, PRESIDENT, THERMO ELECTRON CORPORATION

Mr. YATES. Thermo Electron, Mr. Hatsopoulos.

Your statement may be made a part of the record, sir.

Mr. HATSOPOULOS. Thank you.

[Material follows:]

TESTIMONY BY

DR. GEORGE N. HATSPOULOS
PRESIDENT, THERMO ELECTRON CORPORATION
WALTHAM, MASSACHUSETTS

HOUSE OF REPRESENTATIVES
SUBCOMMITTEE ON APPROPRIATIONS FOR THE INTERIOR DEPARTMENT
THURSDAY, FEBRUARY 19, 1981

Over the past fourteen years, Thermo Electron has been working on the development of practical means for converting waste heat into useful power. This effort has focussed on the organic Rankine cycle, a power conversion system resembling the familiar steam engine, but offering higher efficiency and greater flexibility than steam for many important applications.

No other workable power conversion system can match the demonstrated efficiency of the organic Rankine cycle for recovering waste heat at low temperatures (e.g. from 400°F up to about 750°F). Nor can other systems deliver comparable high efficiency in small packages suitable for extracting power from the exhaust gasses of the internal combustion engines used in vehicles.

These characteristics make the organic Rankine cycle attractive for direct coupling to a diesel engine, thereby creating a compound engine of exceptionally high efficiency. This system is often referred to as a "bottoming cycle" because the organic Rankine cycle engine recovers energy at low temperature; (i.e. the "bottom" of the fuel consuming cycle). The diesel engine, already the most efficient of transportation prime movers, operates in its normal fashion while the organic Rankine cycle engine produces additional power--typically 15 percent of the diesel's output--solely from the waste heat of the diesel.

Over the past 6 years, the bottoming cycle program has received government support, currently under the Department of Energy's Office of Transportation Programs in the Office of the Assistant Secretary for Solar and Conservation Programs. This extensive research and development effort has demonstrated the feasibility of bottoming cycles for heavy trucks. A fully integrated, diesel/organic Rankine cycle compound engine has been built and installed in a long-haul highway tractor. This vehicle has been road tested over 30,000 miles and the first-generation prototype has demonstrated a fuel savings of 12.5 percent in controlled highway tests at Mack Truck, Inc.

Although large tractor-trailers represent only about 10 percent of the total truck population, they account for 31 percent of all truck fuel consumed. Trucks now use about one-third of our total motor fuel and this share is expected to exceed 50 percent by 1985 as truck transport expands and automobile fuel economy continues to improve. Use of organic Rankine bottoming cycles in just the heavy long-haul segment of the trucking industry would save about 2 billion gallons per year of diesel fuel in the late 1980's. If fuel prices continue to outpace the general rate of inflation, bottoming cycles will also become economically attractive for certain medium-duty and off-highway markets, thereby saving additional quantities of diesel fuel.

Trucking fleet operations are highly competitive, particularly with the recent move towards deregulation of common carriers. Typical operating ratios (i.e., the ratio of costs to gross revenues) usually exceed 95 percent. As a result of this extremely narrow profit margin, there exists a strong incentive to purchase the most fuel-efficient equipment. In fact, the 15 percent fuel savings made possible by organic Rankine-cycle technology can result in a profit improvement of more than 30 percent for the truck owner, at diesel fuel prices equal to \$1.50/per gallon. This represents a payback period of less than two years from the bottoming cycle investment by a truck operator.

The bottoming cycle system would be sold as a factory-installed option on new trucks, and no retrofit market is anticipated. Most long-haul trucks are GVW Class 8 (over 33,000 pounds gross vehicle weight) and travel between 60,000 and

150,000 miles per year. Although packaging details will vary somewhat for the different engine/chassis combinations, overall requirements are sufficiently similar throughout the industry to permit common parts to be used on all bottoming cycle systems.

A retail price of \$10,000 (1980 dollars) - a level anticipated to be reached after several years' production - would allow a wholesale target price of \$5,000, assuming a 100 percent total markup for the truck manufacturer and his dealer. Based on a moderate-growth rate for long-haul truck sales, approximately 140,000 such vehicles each year could be candidates for bottoming cycles by 1990--a potential market of \$700 million (1980 dollars) per year for the bottoming cycle subsystem supplier. Additional sales could be obtained in non-truck markets (e.g., buses, boats, pumps, generators, and all other applications for truck-sized engines that demand long operating hours). In 1979, about 90,000 large truck diesel engines were sold for these purposes.

The technical feasibility of the organic Rankine bottoming cycle has been demonstrated over the past 6 years of development with only \$6 million of government support. In a recent evaluation of DOE's heavy truck engine programs, the agency concluded that Thermo Electron's organic Rankine bottoming cycle affords by far the greatest potential pay-off of all competing technologies. However, there remains substantial work to be completed before truck bottoming cycles can be offered for commercial sale. This work, which will require 5 or 6 years to complete, consists of three major tasks: (1) Technology/Engineering Development, (2) Prototype/Fleet Demonstration, and (3) Pre-Production Planning and Facilities Development.

Total cost of the program leading to production readiness in 1987 is estimated to be \$70 million. Working with the Dept. of Energy, Thermo Electron has prepared a plan for joint government and industry sponsorship of the effort. Clearly, much of the expense can and should be borne by the private sector. There are, however, significant technical risks, which must be resolved through further development and testing, before private funding can be raised in today's climate of unprecedented high cost for venture capital. This portion of the program, which is the subject of current DOE sponsorship, would account for

about 40 percent of the planned bottoming cycle expenditures over the next several years. Questions to be resolved by the government supported tasks include thermal stability of working fluids, materials compatibility, environmental effects, and reliability of components.

We believe that the organic Rankine bottoming cycle is one of the most promising new energy technologies available today. No truck engine system under development has shown the potential for efficiency that has already been demonstrated by the diesel-organic compound engine. Moreover, the bottoming cycle technology can be used with even more advanced diesels (e.g., turbo-compound and adiabatic) and with radical new engines such as the ceramic gas turbine, if such engines prove to be feasible.

Bottoming cycles may, in fact, hold as much commercial promise as many of the land-mark developments arising during the 50's and 60's, for example Xerography, Polaroid photography, integrated circuit chips, etc. Nevertheless, this new technology cannot be brought to fruition with private funds alone because of the risk, the long lead time involved, (ten years before significant profits are realized) and the high cost of capital for businesses.

The cost of capital for a corporation is the combined cost of equity and debt. The after-tax cost of equity, determined by the price investors are willing to pay for anticipated net income, has risen from 5.5 percent in the 1960's (an average P/E ratio of 18), to 16 percent in 1979, (an average P/E ratio of 6.25). Similarly the after-tax cost of debt has risen from about 2.5 percent in the 1960's to about 6.5 percent today. For a typical company ...debt-to-equity ratio of 0.3... the after-tax cost of capital has risen from 4.5 percent to over 14 percent. This means a corporation must now earn 28 percent before taxes, even on low-risk investments, compared to 9 percent throughout the 1960's.

Subtracting from these rates the corresponding rates of inflation, (10 percent and 2 percent, respectively), a corporation must now earn 18 percent of pretax income in constant dollars on investments versus 7 percent in the early 1960's. The difference of 11 percentage points is partly due to taxation of the portion of a company's reported profit that is due to inflation and partly to increased risk premiums demanded by the investing public. Thus, the discount rate for future earnings has increased so much that only very short term investments with

paybacks of 2 or 3 years are economically feasible. It is hard to think of any of the technological developments that made our industry great in the post-war era which could have been undertaken in the present economic environment.

The problem has been aggravated by a drop in Federal support for new technology; government sponsorship of R&D declined from 1.6 percent of GNP in 1968 to 1.1 percent in 1980. At the same time, industry's R&D funds have been spread over an increasingly wide range of problems (e.g., energy, pollution, application of new technology such as micro-processors, response to resource and raw material depletion, etc.).

Much of the private expenditure for R&D (43 percent) has gone into aerospace, defense, and electrical machinery. These are exactly the same industries receiving the greatest Federal support. Little government funding has been provided for improving energy productivity in industry, and yet this is the sector having both the greatest need and the most promise. As a result of chronically poor cash flow and inadequate return on capital, there has been very little private expenditure for R&D to develop new processes in steel, aluminum, textiles, paper, etc.).

Motor fuel prices have long been depressed by artificial controls. Sudden removal of these controls has impacted the truck industry, causing a sharp change in the balance of traditional cost factors. Manufacturers of vehicles will require substantial time and large investments to provide new more efficient trucks. Truck manufacturers typically apply only about 2 percent of annual sales to R&D. Those producers who are also in the automobile business (e.g., GM and Ford) must not only meet the needs of future truck product development but must simultaneously satisfy mandated requirements for safety, emissions, and fuel economy in passenger cars as well. These requirements are occurring at a time of severely depressed earnings, very low stock P/E ratios, and high borrowing costs. As a result, the general financial weakness of the automobile industry complex, including its parts suppliers, affects the truck sector as well.

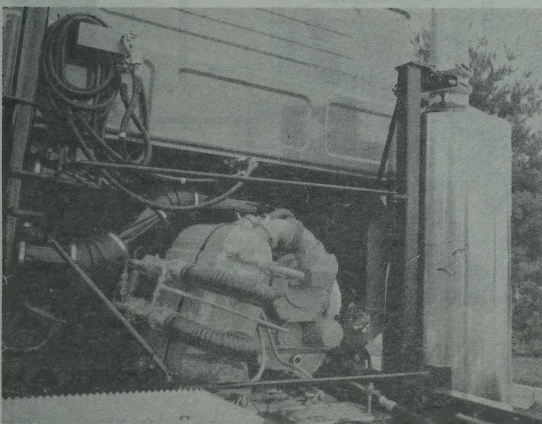
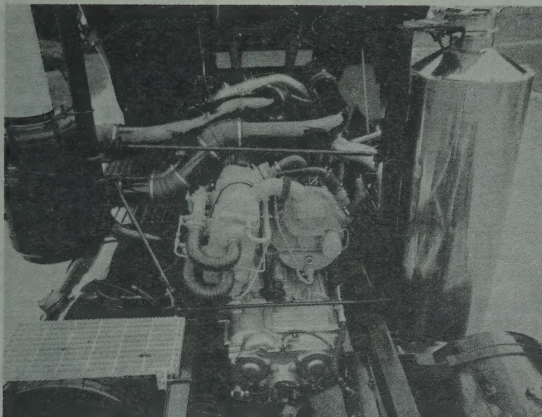
In order to restore the viability of our nation's economy, reduce inflation, arrest the decline of living standards, and improve the U.S. balance of payments, we must improve the competitive position of our industry by increasing productivity. There are two ways to accomplish this goal; (1) increased capital formation, and (2) accelerated technological development. Government assistance is needed for both.

Substantial tax reductions are needed to improve industry's cash flow and increase its ability to invest in new equipment. In addition, government support is required during the high risk phase of development for new energy utilization technologies that will bring about greater productivity in our energy intensive industries. Relatively small amounts of Federal "seed" money for the development of advanced technologies such as the organic Rankine bottoming cycle can provide a highly cost effective mechanism for augmenting the effect of the more costly investment tax stimulants.



BOTTOMING CYCLE SYSTEM FOR ENERGY SAVINGS ON LONG HAUL DIESEL TRUCKS



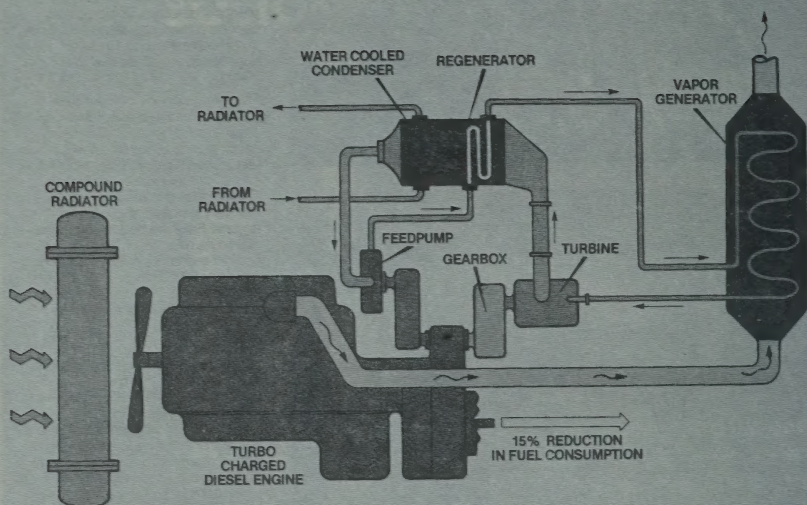


Although numerous alternatives have been suggested for achieving long-term energy independence, conservation must play an important role in meeting the energy requirements of the near future. At present, the transportation sector of the economy in the United States is almost completely dependent on petroleum as its primary fuel source and uses about half of the total petroleum consumed. Internal combustion engine powered automotive vehicles account for the bulk of the total transportation fuel requirements. Therefore, systems that convert currently wasted energy in automotive vehicles to useful power are needed to reduce the near-term transportation fuel requirements.

The major portion of the waste energy in an internal combustion engine is associated with the exhaust gases. Since this energy must be recovered by cooling the exhaust gases, the average temperature available for use in the waste heat recovery process is quite low. The organic Rankine bottoming cycle, due to its relatively high cycle efficiency at moderate peak cycle temperatures of 550° F to 650° F, offers the best potential for converting this energy to useable shaft power.

The organic Rankine bottoming cycle can be considered for various automobile and truck applications. The most attractive use, however, is in large, heavy-duty diesel trucks for long-distance hauling. Here, the engine load and speed requirements are nearly constant over a large portion of the operating hours, and high mileages are accumulated. Thus, the potential fuel savings are sufficient to justify the added cost of a bottoming cycle system.

SYSTEM OUTLINE

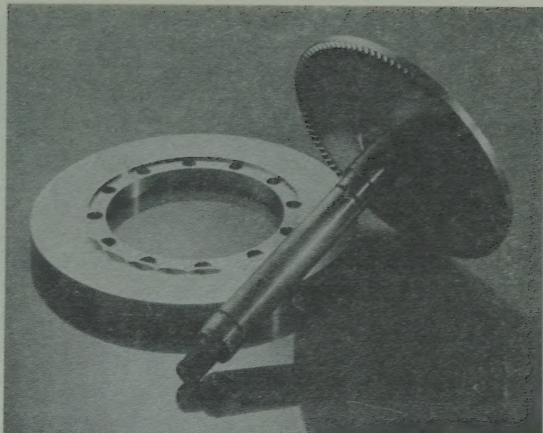


The major components of the bottoming cycle system are the turbine-gearbox, feedpump, vapor generator, condenser, and regenerator. Exhaust gas from the diesel engine vaporizes the working fluid of the bottoming cycle system in the vapor generator. The vaporized working fluid then expands through the turbine, providing additional shaft power to the diesel engine power train. After partially cooling the vapor in the regenerator, vapor de-superheating and condensing occurs in the condenser. The feed-pump then pumps the condensed

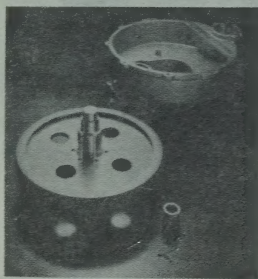
working fluid through the liquid side of the regenerator before it once again enters the vapor generator, completing the cycle.

A single compound radiator with two separate cooling circuits provides cooling for both the diesel engine and the condenser of the bottoming cycle system.

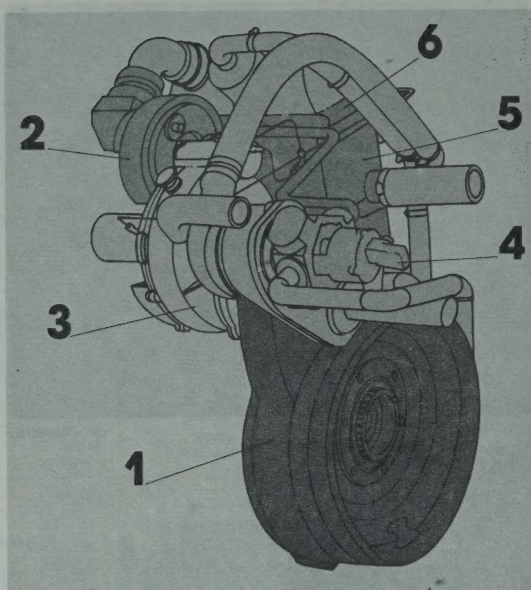
The bottoming cycle system is packaged in three distinct modules to simplify installation of the system in the truck. These modules are the power conversion unit, vapor generator, and cooling system. Assembled and tested as a separate package, the power conversion unit, which contains the turbine-gearbox, feedpump, regenerator, condenser, and auxiliaries mounted around a power takeoff (PTO) gearbox, is installed between the diesel engine and transmission, and provides the mechanical coupling of the turbine-gearbox to the power train. The vapor generator replaces the muffler and an oversized compound radiator is used in place of the standard radiator.



TURBINE



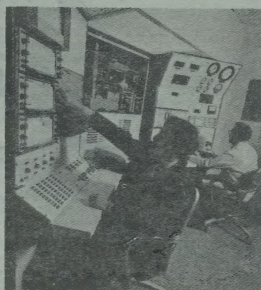
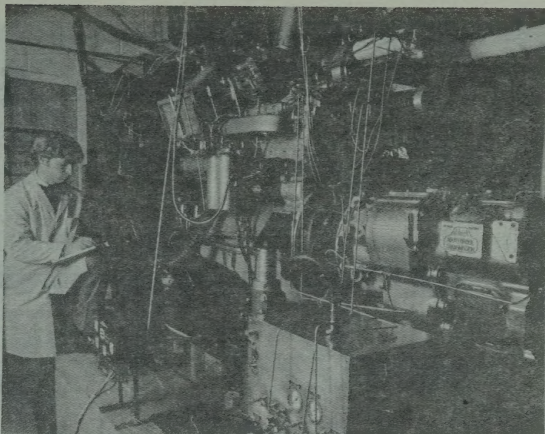
GEARBOX



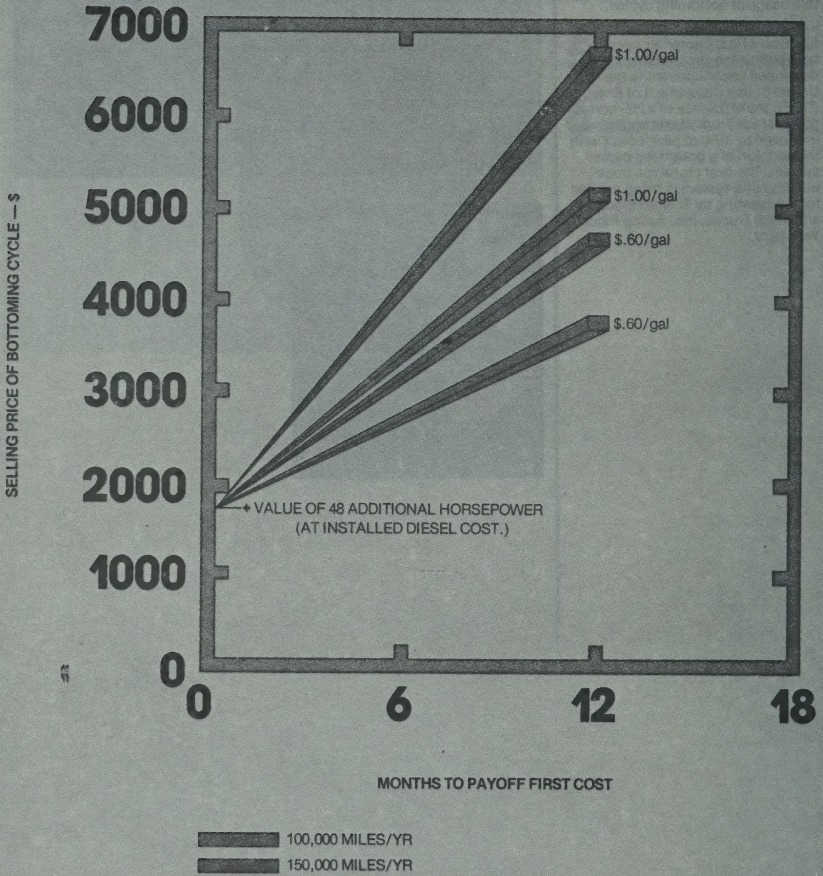
- 1** POWER TAKE OFF
- 2** TURBINE
- 3** GEARBOX
- 4** FEED PUMP
- 5** WATER COOLED CONDENSER
- 6** REGENERATOR

A fully developed bottoming cycle system can provide a 15% improvement in fuel efficiency over a typical duty cycle for long haul diesel trucks and reduce the emission levels by an amount equal to the gain in efficiency. This 15% efficiency improvement corresponds to an annual savings of 3000 to 4000 gallons of fuel per truck. This corresponds to a savings of 124 million barrels of oil per year at the expected consumption rate for heavy duty diesel trucks in 1980. The steadily rising price of fuel provides a growing incentive for this usage of bottoming cycles.

In tests completed to date at Thermo Electron's R&D Center on a prototype bottoming cycle system being developed under contract to the United States Department of Energy (DOE), the efficiency of a 285 horsepower Mack Truck diesel engine was improved by 16% at peak power with the addition of a bottoming cycle system. The first prototype truck utilizing this system is being readied for road testing by Thermo Electron and Mack Trucks, Inc. during Fiscal Year 1979.



ECONOMIC INCENTIVE



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Principal Offices and Plant Locations

Corporate Office

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Metallurgical Furnaces

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94 Bessemer Court
London, Ontario, Canada

Loftus
5 Gateway Center
Stanwix Street and
Boulevard of the Allies
Pittsburgh, Pennsylvania 15222

Metals and Metallurgical Services

Cal-Doran Division
2830 East Washington Boulevard
Los Angeles, California 90023

Houston Division
411 Jackson Hill Street
Houston, Texas 77007

Metal Treating Division
1575 West Pierce Street
Milwaukee, Wisconsin 53204

Perfection Heat Treating Division
11650 Worman Street
Detroit, Michigan 48239

Refractory Metals Division
9 Crane Court
Woburn, Massachusetts 01801

Papermaking Equipment

Lodding
Sword Street, P.O. Box 269
Auburn, Massachusetts 01501

AER Corporation
100 Hilltop Road
Ramsey, New Jersey 07446

Joseph Winterburn Ltd.
P.O. Box 6, Riverside Works
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Lodding de Mexico, S.A.
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Environmental and Health Monitors

Air Pollution Instruments
108 South Street
Hopkinton, Massachusetts 01748

Analytical Instruments
45 First Avenue
Waltham, Massachusetts 02154

Power Systems

Cogeneration Systems
45 First Avenue
Waltham, Massachusetts 02154

Marine Engines
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Sterling Heights, Michigan 48077

Waltham R&D Center

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Waltham, Massachusetts 02154

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Thermo Electron serves worldwide industrial, Government, and utility markets with products and services that use thermodynamic technology. The company manufactures controlled-atmosphere metal-processing furnaces, papermaking equipment, refractory metals marine engines, environmental instruments and waste-heat recovery equipment, and provides metal heat-treating and forming services. Thermo Electron also engages in a broad range of research programs sponsored by the company, by the Government, and by utilities, having as their objective the application of thermodynamic technology to the development of new products and processes. A major portion of these programs is directed at improving the effectiveness with which industry utilizes its resources of capital, energy, and materials.

Mr. YATES. I have to catch a plane so Mr. Loeffler is going to take over for me.

OPENING REMARKS

Mr. HATSPOULOS. My statement addresses what we consider a very exciting technology that can extract heat from fossil engines and use that heat to add power to the diesel engine. This technology which has been developed in the last 14 years in our company has been applied in the last five years with the help of the Department of Energy into truck engines and has been incorporated actually in a truck built by the Mack Truck Corporation and this truck in demonstration has run 30,000 miles showing a 12.5 percent fuel efficiency. I do not, however, know what that technology can do for the country. I would like at this time to address a different question.

I would like to talk to you more generally about the industrial conservation program at the Department of Energy. We have followed that program for the last few years and in our opinion and the opinion of many others this has been one of the most cost effective programs that not only this country has undertaken but compared to similar programs in other countries it has been most cost effective and most successful. It would utilize a very small amount of money to be able to generate interest on the part of industry and especially industry that is suffering very much by imports or industry that has been hit hardest by energy prices to be able to introduce technology so that maybe by the end of this decade we can get our industry competitive in the international area and we can improve productivity.

The amount of money that has been spent in the industrial programs and the Department of Energy for a year has been under \$50 million and if you add the Department of Energy's support for the transportation industry to that, you still come with a very small amount of money with prospects for essentially generating the equivalent of dollars per day corresponding to about 30 cents per barrel. What I mean by that is that the seed money that the Department of Energy has put in, if you divide it by the kind of conservation that is likely to occur in the late 1980's, the price is about 30 cents a barrel and I don't know of any projects in this country that have been anywhere near as closely effective as that. Yet, it appears to us that the current administration wants to eliminate those programs on the ground that if they are so good industry should sponsor them.

Well, I would like to say just a few words about this because I think that being a businessman I can tell you how a businessman has to think. In the 1960's the cost of capital in this country was 4.5 percent to industry. Right now it is over 14 percent and I am not talking about the short-term rates, I am talking about the after tax effect of equity and long-term borrowing.

The result of this has been that anything that can pay off in the long periods of time has to be discarded because according to very simple economics theory if you expect to get returns eight years from now you have to discount that at the cost of your capital. If you start discounting after tax, at 14 percent or over, with a tax rate of about 50 percent, including State taxes, you have to discount about 28 percent before tax as opposed to 7 percent for the 1960's. That means that many of the projects that made this coun-

try great in the 1950s and 1960s are no longer feasible to be funded by industry and all the industrial funding as you will see across the board has been concentrated to things that can pay off in two or three years. You cannot go any further.

TAX INCENTIVES

Mr. LOEFFLER (presiding). What about tax incentives?

Mr. HATSOPOULOS. Obviously tax incentives, and we thought about R&D tax incentives which are very difficult to administer. We have been asked by several people in the Senate and the Congress to propose such R&D tax incentives but we have been unable to see how we can charge the Internal Revenue Service with the job of selecting which R&D projects should deserve a tax credit because they involve conservation or which should not. It would require you to make the IRS another DOE in terms of scientific expertise.

Mr. LOEFFLER. Would you not have a greater spectrum of R&D projects that would be taken care of by the IRS than DOE? DOE would make the determination that either you or I or someone else deserves the tax credit and therefore the number of recipients wouldn't be as great.

Mr. HATSOPOULOS. Don't misunderstand. Let me make two general statements to put the thing in the right perspective. We think we agree with the President that our industry is in a declining state and that we as a Nation cannot attack inflation or decline the standard of living without having industry to start becoming competitive and more productive.

Now that requires two things. One, which everybody knows, it is capital formation because you need capital in order to increase productivity and be competitive but one thing that has not been stated in the paper which is alongside with capital formation is technology and what the cost of capital has done to cap the formation and what it also has done to technology that cannot be developed over a short period of time.

Any technology like, say, Xerox that is coming out, it may take eight or ten years although to say Polaroid camera will take you eight or nine or ten years is out of the question if the Japanese and German allies can do it because their climate is correct. By the late 1980s we will be in a worse position in terms of productivity or competitiveness as opposed to other industrial nations. The situation is a very key one and to cut the very seed of a program that is insignificant in amount in order to save fifty or one hundred million dollars I think is inconceivable.

Mr. LOEFFLER. Do you have anything else that you would like to add for the record?

Mr. HATSOPOULOS. No.

Mr. LOEFFLER. Thank you.

MECHANICAL TECHNOLOGY INCORPORATED

DOE CONSERVATION PROGRAM

WITNESS

L. R. LAWRENCE, JR., DIRECTOR, TECHNICAL DEVELOPMENT

Mr. LOEFFLER. Next is Mechanical Technology Incorporated, Mr. Lawrence.

Mr. LAWRENCE. Thank you, Mr. Chairman.

Mr. LOEFFLER. Those are hard words to have fall on the ears of a Republican who has been on the subcommittee for only two weeks. How pleasing it is.

Please proceed. Your formal statement will be incorporated in the record at this point.

Mr. LAWRENCE. Thank you, Mr. Chairman.

[Material follows:]

House of Representatives
Committee on Appropriations
Subcommittee on Interior

Hearings on DOE Conservation Program

February 19, 1981

Prepared by:

Dr. L. R. Lawrence, Jr.
Director
Technical Development



Mechanical Technology
incorporated

Mr. Chairman and Members of the Committee:

I am Dr. L.R. Lawrence, Jr., The Director for Technical Development of Mechanical Technology Incorporated (MTI). MTI is a high-technology organization dedicated to evolving products which are in the national interest, from our strong technology core. We are the epitome of the small, aggressive company responsible for a large part of the "industrial innovation" which occurs in this nation, and we have been successful in commercializing our innovations as may be seen by our corporate 30% growth rate and our revenue mix of 45% products sales, and 55% R&D. Approximately 50% of our business is with the federal government, and the rest is associated with the private sector.

I am here before you today to discuss the Technology Development efforts in the DOE Conservation program, their national benefit, and their funding requirements for FY 1982. These programs are:

<u>Program</u>	<u>FY '82 Required Funding</u>
Vehicle Propulsion R&D (Stirling Engine Development)	\$84.7M (\$23.5M)
Industrial Energy Conservation	\$120M
Technology and Consumer Products (Heat Pumps)	\$33.5M (\$15M)
Energy Conversion & Utilization Technologies	\$15M

Mr. Chairman, during 1980, the United States used an average of approximately 16.7 million barrels of oil per day of which 6.8 million were imported. This is a better record than projections of a few years ago had indicated, but disconcerting in that it shows that much of our critical energy supply still originates from insecure sources.

Last year, at this time, MTI came before the congress to discuss the then 18% inflation rate and the impending recession. At that time, we entered a number of suggestions which could help to strengthen the nation and help reverse the inflation/unemployment situation with a future strengthening of our national, technological, energy conversion posture.

At this time, let me review with a brief description what is meant by energy conversion.

As may be seen in Figure 1, energy conversion is the process by which fuel (or electricity) is converted through a boiler, motor, car engine, furnace, industrial turbine, air conditioner, electric light, or some other energy conversion device, to a needed end-use energy form (generally heat, light, or work). Figure 2 shows what happens when our end-use need remains unchanged, but the conversion efficiency is improved. In this case, more of the incoming supply is converted to an end-use need, and less waste heat is rejected. Therefore, as Figure 2 shows, less overall supply (2 units instead of 3 units) is needed, while the end-use need remains fulfilled.

In going from Figure 1 to Figure 2, the conversion process efficiency has been improved from 33% to 50%, thereby reducing the needed fuel by 1/3, while maintaining the amount of needed end-use energy. Obviously, improved processes of energy conversion are potentially of substantial benefit to the nation and its consumers.

In addition to simply improving conversion efficiency, it is in the national interest to utilize waste heat effectively. In Figure 3, the efficiency of the conversion process is the same as in Figure 1, but some previously wasted heat is recaptured in a form suited to the end-use need. Therefore, by fulfilling the end-use need from both the conversion process and from previously wasted heat, less energy supply is needed.

Finally, Figure 4 shows how heat-pumping can be employed to lessen the amount of energy supply needed to fulfill the end-use need. In the case of heat-pumping, energy present in the atmosphere is "pumped" into the conversion process and is delivered in a form suited to the end-use need. This utilization of atmospheric energy displaces a significant amount of previously needed energy supply.

This concludes the brief review of these key concepts for our nation's energy future.

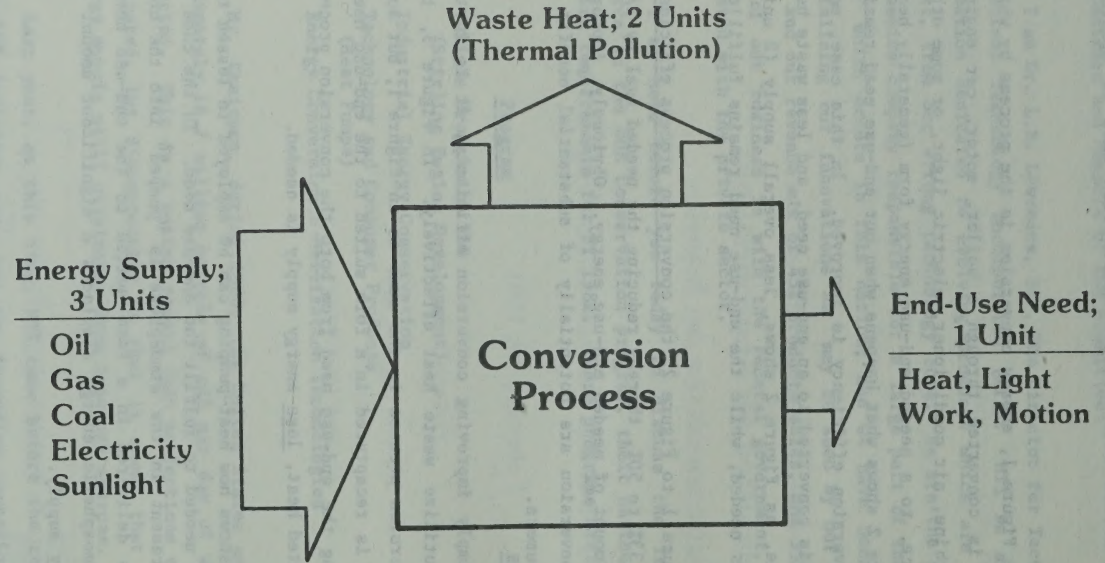


Figure 1: Energy Conversion Process
Example Shown - Approximately 33%

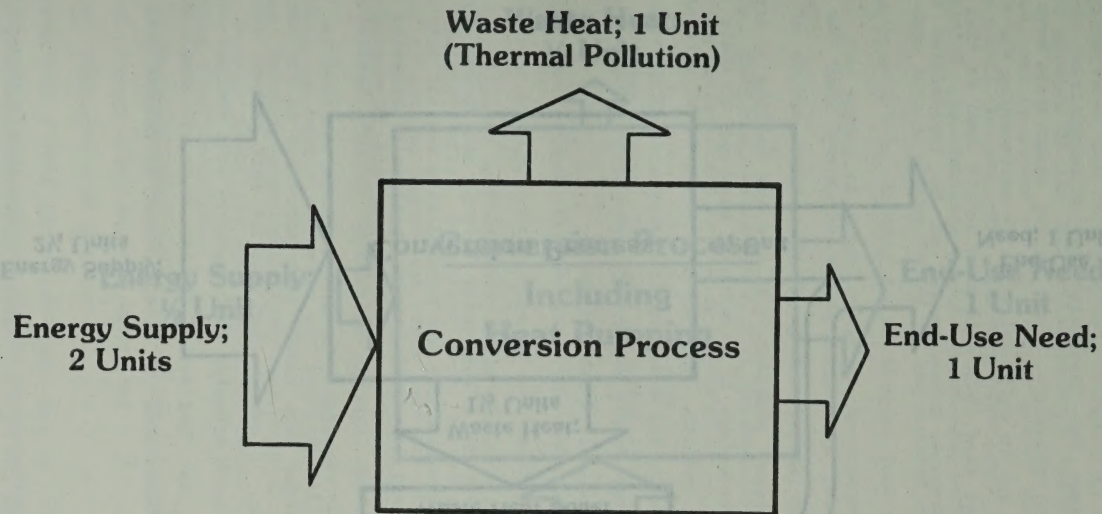


Figure 2 A 50% Efficient Conversion Process

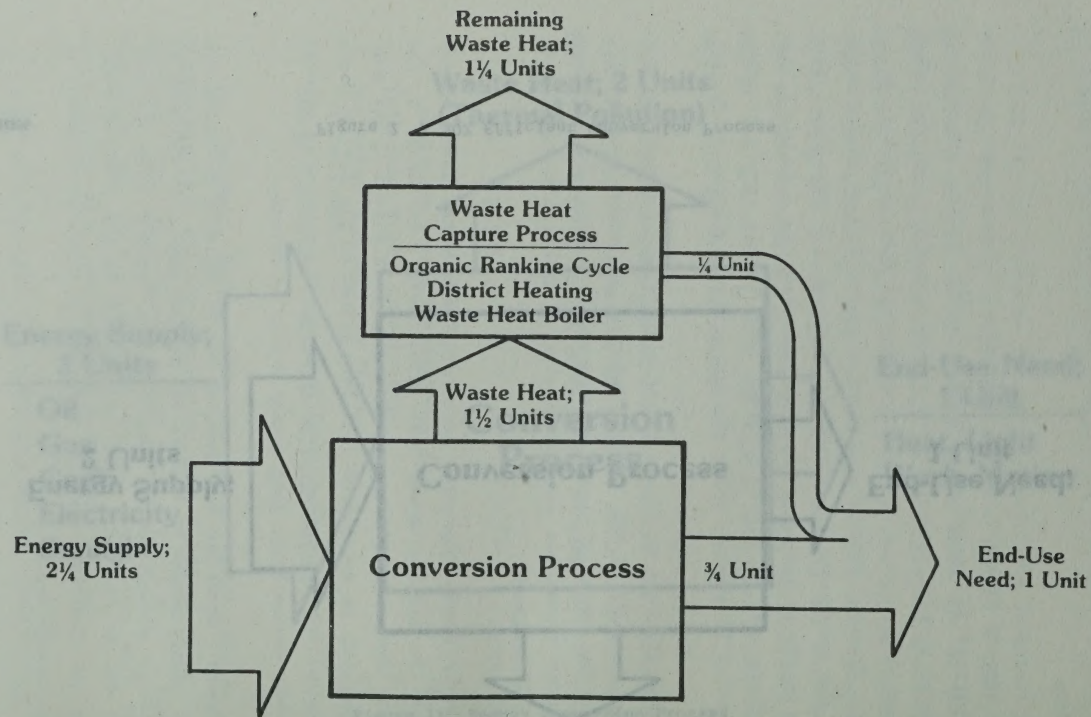


Figure 3 Capturing Previously Wasted Heat From a 33% Efficient Conversion Process

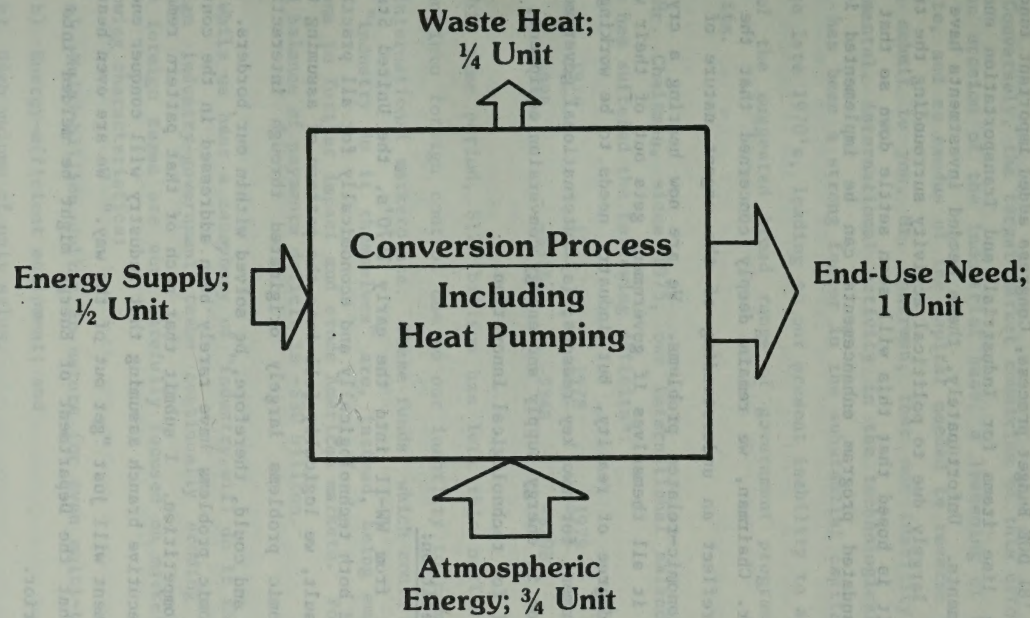


Figure 4 Heat Pumping

During the FY '81 DOE Budget process, Congress added important funding increments to the line items for Industrial and Transportation energy conversion improvements. Unfortunately, these needed investments have yet to be implemented, largely due to political activity surrounding the transition process. It is hoped that this will soon settle down so that the congressionally mandated program enhancements can be implemented in a timely fashion.

This year, Mr. Chairman, we remain deeply concerned that the DOE budget does not reflect an understanding of the urgent nature of the nation's energy-economic-related problems. We are now hearing a cry of "industry will do it all themselves if government gets out of their way" which contains a degree of reality, but industry needs to be working in concert with government for two key reasons; (a) international government/industry competition in energy supply and energy conversion equipment; and (b) lack of capital for technological innovation.

International Competition:

Mr. Chairman, from WW-II into the early 1970's, the United States dominated the world both technologically and economically for all practical purposes. As a result, we logically fell into the pattern of assuming that technological/economic problems largely originated through interactions within our borders and could, therefore, be solved within our borders. Our technological/economic problems have rarely been addressed in the context of international competition. I submit that much of that pattern remains today, with the executive branch assuming that industry will conquer energy problems if government will just "get out of the way." We are even hearing alarming rumors that the Department of Energy might be melded into the Department of Interior.

Mr. Chairman, I submit to you that the early 1980's are markedly different than the years from 1945-1973. Foreign government/industry teams have formed, and are successfully making a dedicated effort to dominate the international, multi-billion-dollar markets in energy conversion equipment. They have not missed the fact, as we have, that product dominance in such areas as automobiles, automotive engines, space conditioning equipment, and efficient industrial equipment have major national benefits.

Conversely, the target market countries of this effort are experiencing an erosion of the industrial base, a lessening of the capability to compete, and an exodus of the capital needed to reverse the situation. I would submit to you, Mr. Chairman, that our inability to address this fundamental, international activity in the technological/economic energy arena has been a strong factor in the substantial capital outflow of the mid to late 1970's, leading to our present inability to address the totality of the suggested broad range of government programs without budget deficits.

Mr. Chairman, since 1975, our international balance of merchandise trade has suffered the following deficits*:

<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>
-\$9B	-\$31B	-\$34B	-\$29B	-\$24B

In this time period, \$127 billion has left this nation's hands and has fallen into foreign control due to our inability to compete favorably in the international marketplace. These funds, which could have been used to help "industry do it themselves" are, instead, being employed by foreign nations to further impact and erode American markets. For 1981, our estimated balance of payments deficit is -\$30 billion.

While we hear a cacophony of "industry will do it themselves," we see foreign industry-government teams continually eroding our marketplace. These foreign teams are very carefully focused on markets which have the following characteristics:

- a) Multi-billion dollar in nature (or even multi-tens-of-billions);
- b) Energy-efficient equipment; and
- c) High volume of unit sales.

For the nation with success in the international marketplace, in markets with these characteristics, the following benefits accrue:

*Ref.: U.S. Department of Commerce

- 1) Less requirement for oil imports due to implementation of higher efficiency equipment (high mpg cars, heat pumps, solid-state electronics);
- 2) A major positive effect on the balance of payments for the nation which is dominant in these multi-billion-dollar markets;
- 3) A net influx of capital into the industries competing successfully in these markets, enabling them to carry out R&D to improve their products, thus enabling further expanding penetration in these marketplaces; and
- 4) A major positive effect on employment.

In this arena, the United States is now the victim; not the victor. We are now negatively impacting our balance of payments through the purchase of foreign, energy-efficient equipment, the need for which was brought on by the purchase of foreign oil. In the middle of this mess, we continue to hear a cry of "industry will do it alone." I fail to see where American industry, alone, depleted of capital, is going to compete successfully in international marketplaces against dedicated, well-coordinated, focused, foreign government/industry teams.

At this point, it would be nice to interject a positive note about how we are obviously going to overcome all this. Unfortunately, I cannot, since our response to our balance of payments problems has been to encourage the export of foodstuffs, coal, and raw materials. We are providing raw materials and food to Germany, Japan, and other countries while simultaneously providing a market for finished products. This has, historically, been the role of a colony.

Mr. Chairman, as a nation, we clearly know how to evolve technologically superior products for a multi-billion-dollar market. We have done it in the military equipment arena and in the aerospace industry. In both cases, government and industry have worked together, with government supplying the major part of the higher risk R&D dollars, while industry provides manufacturing know-how. The role of NASA in providing United States supremacy in the aircraft industry needs to be emulated in the energy

conversion equipment industry; i.e., automobiles, industrial manufacturing equipment, heating and cooling units, and the like. The only base which we have, at the moment, to achieve this end is the battered programs in Industrial Conservation, Transportation, Technology and Consumer Products, and Energy Conversion and Utilization Technology at DOE. In the present OMB draft request, these programs will be reduced from \$213M in 1981 to \$81M in 1982.

Mr. Chairman, the situation is critical. If the nation is to remain competitive over the next 20 years in the areas of automotive heat engines, industrial equipment, heat pumps (electric and gas-fired), and industrial processes, then it must somehow evolve revolutionary, energy-efficient options to "leap-frog" the present technological lead of foreign nations. The risk of evolving such needed revolutionary equipment is clearly beyond the normal corporate means of American industry, and is almost universally outside the bounds of normal corporate investment criteria. The government must play a significant and continuing role in evolving revolutionary energy conversion equipment to counter the successes of foreign government-industry teams.

At this time, let me raise a warning flag and point out another multi-billion-dollar market, in energy conversion equipment, which is about to be attacked by foreign government/industry teams. The time is ripe for them, and we are unprepared for the onslaught. The arena is that of heating, ventilating, and air-conditioning equipment; specifically, heat pumps.

Heat Pumps (Recommended - \$15M):

Electric heat pumps have been in the marketplace for about 30 years. However, the impetus for broad implementation was only reached in the early 1970's as, concurrently, the technology matured, the availability of natural gas dwindled resulting in moratoriums, the rate of new residential construction starts increased, and the price of electricity increased markedly. This produced a market demand which led to the following shipments of residential units:

HEAT PUMP SHIPMENTS

(000 Units)

<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>
67	81	87	97	128	250	493

This rapid market expansion led to projections by the nation's leading market forecast houses of over one million units per year by 1990. In turn, this led heat pump and compressor manufacturers to invest in extensive new production capacity in order to meet the projected market demand, and (in some cases) the construction of additional capacity in an attempt to increase market share. A projection by one leading market analysis house, which they labeled "pessimistic," projected the following unit sales:

PROJECTIONS (AT THE END OF 1977)

HEAT PUMP DELIVERIES

(000 Units)

<u>1977 (Actual)</u>	<u>1980</u>	<u>1985</u>	<u>1990</u>
493	640	780	1001

The blow to electric heat pump manufacturers came in 1978 through this past year (1980). With the increased availability of natural gas and the lifting of gas moratoriums, electric heat pump deliveries were (000 Units):

<u>1978</u>	<u>1979</u>	<u>1980 (estimated)</u>
572	548	550

With the heat pump and compressor manufacturers now generally substantially over-committed in terms of capacity, paying high interest rates on their capital loans for facilities, and in a low profit margin market, they are generally in a weak financial position. As a result of this situation, electric heat pump systems, with revolutionary improvements in design and efficiency, are neither being invested in, nor are revolutionary units desired by the U.S. manufacturers for the foreseeable future. The manufacturers must, somehow, get a return on their present investment in plant and tooling, designed to produce present-generation products. As a result,

the only new U.S. heat pumps we see entering the marketplace are units with two "present generation" compressors instead of one (for modulation), improved controls, and more heat exchange surface.

Unfortunately, without substantial help from EPRI and DOE, the U.S. electric heat pump marketplace will soon experience foreign incursions. While our own manufacturers are in difficulty, the Japanese and German interests are actively seeking advanced, high-efficiency, revolutionary products with which to expand into the international marketplace. One can envision, in about five years, major incursions into the U.S. marketplace by Japanese and European advanced models. These are already being seen, in quantity at ASHRAE* shows. With increasing demand by the public for cost-effective high efficiency, the foreign units should sell well, further negatively impacting American heat pump manufacturers.

Thermally Activated Heat Pumps

Thanks to the U.S. Congress, a significant DOE program in thermally activated (gas-fired) heat pumps was initiated in FY 1979. This program, in concert with activity at the Gas Research Institute, has come to the point, today, where a number of gas heat pump prototypes are undergoing laboratory testing. On the average, these heat pumps should be able to meet residential heating needs using 1/2 the gas presently used. When used for heating and cooling, these gas heat pumps should use significantly less gas annually than in-place gas furnaces use just for heating.

At a time when this program is finally coming to fruition, OMB is adopting a philosophy which would eliminate laboratory prototype development and field testing. Again, we hear "industry will do it themselves." Unfortunately, our foreign competition is not "doing it themselves." They are doing it with well-coordinated government/industry teams. Even as OMB moves to cut DOE programs which are "product-oriented," our Japanese allies are giving American gas companies multiple units of first, gas-fired heat pump equipment for field testing. If we do not understand quickly what is

*American Society for Heating, Refrigeration, and Air-Conditioning Engineers.

happening in this arena, we take the risk of losing to foreign interests in still another multi-billion-dollar market with resulting American unemployment and negative cash flow.

Transportation:

Mr. Chairman, I needn't dwell on the present state of the American automotive industry. We are all well aware of the extreme crisis faced by this industry, with domestic corporations deeply in a loss position, unemployment rampant, and ever increasing penetration of our domestic market by foreign manufacturers.

For the purpose of consistency, I would, briefly, like to place in the record some of the key facts surrounding this crisis. Figure 5 shows the consistent trend of foreign penetration of our domestic markets since 1976. With gasoline now deregulated, we can be assured that this trend will continue (unless trade restrictions are enacted).

Concurrently, in August of 1980, the nation faced the following total indefinite layoffs:

<u>Corporation</u>	<u>Total Hourly Work Force</u>	<u>Indefinite Layoffs</u>	<u>Percent of Work Force</u>
General Motors	471,000	137,000	29%
Ford	190,000	69,000	36%
Chrysler	101,000	41,300	41%
American Motors	<u>16,000</u>	<u>2,750</u>	<u>17%</u>
Total	778,000	250,050	32%

SOURCE: Ward's Automotive Reports, August 11, 1980.

These numbers do not include the secondary and tertiary unemployment effects.

In order to compete effectively, then, in this extreme market condition, the automotive companies are becoming less and less "vertically

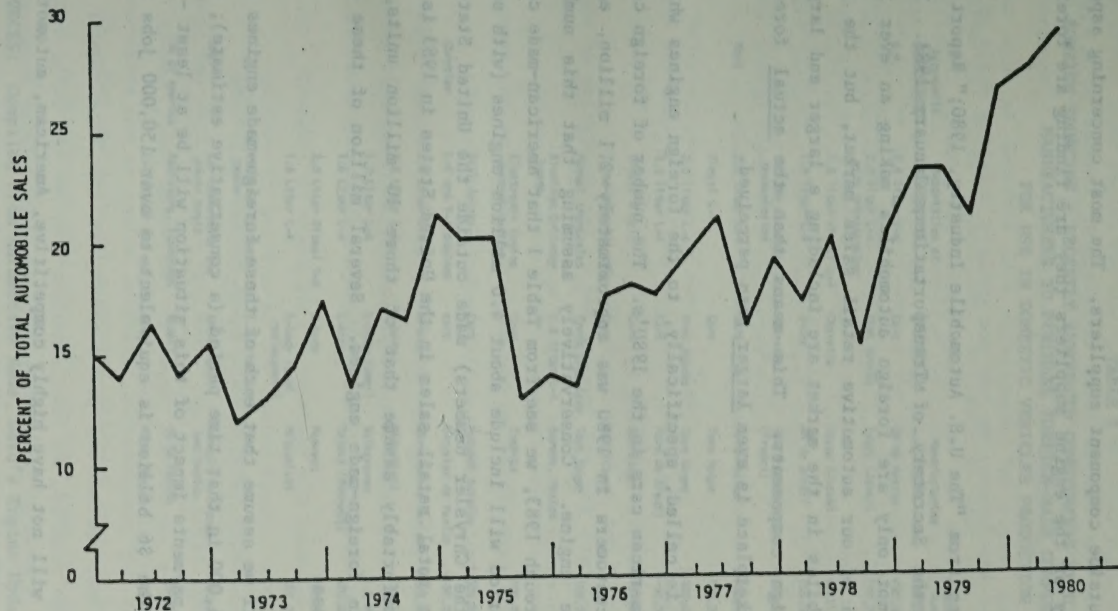


Figure 5: Import Share of U.S. Retail Sales (Units, Quarterly Data).

Source: Ward's Automotive Report.

integrated." Instead of producing all components themselves, the companies are searching for outside component suppliers. The most concerning aspect of this is that many of the engine suppliers they are finding are foreign sources.

Table 1 is taken from "The U.S. Automobile Industry, 1980;" Report to the President from the Secretary of Transportation, January 1981. The table shows that, not only are foreign automobiles making an ever increasing penetration of our automotive retail sales market, but the remaining U.S. automobiles in the market are including a larger and larger percentage of foreign components. This means that the actual foreign dominance of our marketplace is even larger than perceived.

Your attention is called, specifically, to the foreign engines which will be placed in American cars in the 1980's. The number of foreign cars delivered to U.S. customers in 1980 was approximately 2.1 million, each with a foreign-made engine. Conservatively assuming that this number remains constant through 1983, we see from Table 1 that American-made cars in the same time period will include about 4.0 million engines (with some uncertainty as to the Chrysler numbers) made outside the United States. Assuming, then, that total retail sales in the United States in 1983 is 10 million, we can comfortably assume that of those 10 million units, 6 million will contain foreign-made engines. Several million of these engines will be Japanese.

Mr. Chairman, if we assume that each of these foreign-made engines has a factory cost of \$1,000 in that time period (a conservative estimate), the negative balance of payments impact of this situation will be at least - \$6 billion annually. The \$6 billion is equivalent to over 150,000 jobs directly.

All because we will not have highly competitive, American, automotive engine options.

Mr. Chairman, if we project this situation further into the future, without significant government action, we can see ourselves falling further

TABLE 1

FOREIGN SOURCING - RECENTLY ANNOUNCED COMMITMENTS BY U.S. AUTOMOBILE
MANUFACTURERS TO PURCHASE FOREIGN-MADE COMPONENTS
FOR USE IN DOMESTIC VEHICLES PRODUCTION

Automobile Manufacturer	Description of Component	Intended Use	Manufacturing Source	Approximate Number of Components	Period
G.M.	2.8 liter V-6	Cars	GM de Mexico	<400,000/year	1982-
	2.0 liter L-4 with transmission	Mini trucks	Isuzu (Japan)	100,000/year	1981-
	1.8 liter diesel L-4	Chevette	Isuzu (Japan)	small numbers	1982-
	1.8 liter L-4	J-car	GM de Brazil	250,000/year	1979-
	7MM 180 automatic transmission	Chevette	GM Strasbourg (France)	-250,000/year	1979-
Ford	2.2 liter L-4	Cars	Ford-Mexico	<400,000/year	1983-
	Diesel L-4	Cars	Toyo Kogyo	150,000/year	1983-
	2.0 liter L-4	Mini trucks	Toyo Kogyo	<100,000/year	1982-
	2.3 liter L-4	Cars	Ford de Brazil	-50,000/year	1979-
	Diesel 6 cyl.	Cars	BMW/Stegor	100,000/year	1983-
	Turbo-diesel/4 cyl.	Cars	BMW/Stegor	-	1985-
	Manual transaxles	Front Disc Cars	Toyo Kogyo	100,000/year	1980-
	Aluminum Cylinder heads	1.6 liter L-4	Eurone, Mexico	-	1980-
	Electronic Engine control devices	Cars	Toshiba	100,000+/year	1978-
Chrysler	Ball Joints	Cars	Miyasahi Seimbu	1,000,000/year	1980-1984
	L-6 and V-8 engines	cars	Chrysler de Mexico	<100,000/year	early 1970's
	2.2 Liter L-4	K-body	Chrysler de Mexico	<270,000/year	1981
	2.6 Liter L-4	K-body	Mitsubishi	1 Million	1981-85
	1.7 Liter L-4	L-body (Omni)	Volkswagen	1.2 Million	1978-82
	1.6 Liter L-4	L-body	Talbot (Peugeot)	400,000 total	1982-84
	2.0 Liter Diesel V-6	X-body	Peugeot	100,000/year	1982-
	1.4 Liter L-4	A-body (Omni replacement)	Mitsubishi	300,000/year	1984-
	Aluminum Cylinder Heads	2.2 liter L-4	Flat		
AMC	Car components and power train	AMC-Renault	Renault in France and Mexico	300,000/year	1982-
VW of America	Radiators, Standings	Rabbit	VW de Mexico	250,000/year	1979-
	L-4 diesel and gas	Cars	VW de Mexico	300,000 +/-year	1982-

SOURCES: Compiled from Automotive News, Ward's Engine Update, Ward's Automotive Report, American Metal Market, Detroit Free Press, and Japan Economic Journal

and further behind in engine technology, leading to less and less capability to compete in the international marketplace, leading to a weaker, less-employed nation.

Projecting into the future, we can see clearly that the goals of the 1978 Automotive Propulsion R&D Act remain viable and intact. The nation will desperately need, in the late 1980's and 1990's, a viable engine option which can compete with high-efficiency foreign options. To enhance this engine competitiveness and attractiveness, it should not only provide very high miles-per-gallon, but it should have multi-fuel capability, and meet the 1985 emission standards. The government, only, has the combined resources and incentive to evolve such a revolutionary option.

To summarize then, Mr. Chairman, a viable, American, automotive engine option will have the positive benefits of:

- 1) Less requirement for oil imports due to implementation of higher efficiency equipment; i.e. - higher mpg cars;
- 2) A major positive effect on the balance of payments and unemployment in this multi-billion-dollar market;
- 3) A net influx of capital into the successful engine industry, enabling them to carry out R&D to further improve their products and further penetrate the market, thus further protecting the future.

The Stirling Engine Program (Recommended FY '82 Funding - \$23.5M)

Mr. Chairman, MTI feels that high technology organizations can provide future options for the automotive industry. We would like, simply, the opportunity to apply our considerable technical talent to the evolution of a viable, competitive, automotive power plant for the late 1980's and 1990's. Our program results, so far, indicate that we are fully technologically competent and capable of achieving this goal. After three years of effort, our program is on schedule, and within target cost.

The Automotive Stirling Engine (ASE) project is directed toward developing and demonstrating the Automotive Stirling engine as a viable

alternative heat engine for use by the U.S. auto industry. The Stirling is theoretically the most efficient of the alternative heat engines now under development. It offers other potential advantages over conventional engines such as improved fuel efficiency, low noise, acceptable emissions, alternative fuels capability, reliability and low maintenance over a vehicle's life. The Automotive Stirling engine can be a feasible competitor to the spark ignition and the diesel engine and can provide a more socially acceptable engine for future personal transportation by maximizing the efficiency of the total energy balance through the use of a mix of future petroleum and synthetic fuel supplies, as well as the high efficiency energy conversion characteristics.

Major achievements to date include:

- 1) Installation and test of baseline engines in three vehicles, i.e., an Opel, an AMC Spirit, and an AMC Concord. These engines met or exceeded the miles-per-gallon found with standard internal combustion engines and demonstrated environmental acceptability with a variety of fuels including gasoline, diesel, kerosene and alcohol (Exhibit 1).
- 2) Creation of an effective management approach to utilize two transatlantic subcontractors. This has been critical to keeping the program on schedule and providing for technology transfer.
- 3) Transfer of meaningful technology and know-how regarding Stirling engines in general to the United States, and resultant expansion upon this technology in the United States.
- 4) Completion of design and initial testing of the first Stirling engine designed specifically for automotive application (MOD-I).
- 5) The operation of prototype Stirling engines in the laboratory at efficiencies well over 30%; or more than 50% above the efficiency of conventional internal combustion engines.
- 6) Completion of the Reference Engine Design which is intended to guide component, subsystem, and engine system development.

EXHIBIT I

Miles per gallon:
(EPA measured on unleaded gasoline)

<u>Opel</u>		<u>Spirit</u>	
<u>Diesel</u>	<u>Stirling</u> (3000+ lbs)	<u>Standard V-8</u>	<u>Stirling</u> (3500 lbs)
Combined: 24.8 mpg	*23.3 mpg	Urban: N/A	17
		Highway: N/A	28.7
		Combined: 18	20.8

Emissions

gm/mile (EPA measured)

	<u>Opel Diesel</u>	<u>Opel Stirling</u>	<u>Spirit Stirling</u>	<u>1985 Standard</u>
CO	1.6	1.43	3.0	3.4
HC	.32	.12	.12	.41
NOx	1.48	.37	.59	0.4

*Corrected for energy density difference between diesel and unleaded gasoline

- 7) Validation of computer design codes with baseline engine test data.
- 8) Key technology improvements in critical components.

The MOD I engine is the program's first Stirling engine designed specifically for automotive use and is a stepping stone to the program's final prototype engine, the ASE MOD II. Analysis of the MOD II present design indicates that this engine will produce a 56% improvement in fuel economy over a conventional 1984 spark ignition engine in the same vehicle (42 mpg versus 27 mpg in a 3500 lb car).

Specific activities of the Stirling engine project for FY 1982 are to complete engine dynamometer testing of the ASE MOD I, complete installation of four MOD I engines in two AMC Spirits, an AMC Concord, and a front-wheel drive Oldsmobile Omega, and initiate extensive vehicle performance/optimization testing, as well as selective vehicle demonstrations. The design of the ASE MOD II will be completed by the end of FY 1982 and will incorporate the validated ASE MOD I technology as the design baseline. Component, subsystem, and rig testing in the seals, materials, and combustion areas including multi-fuel capability will continue. Financial, marketing, and licensing studies, with the objective of attracting a U.S. engine manufacturer, will be completed.

Mr. Chairman, it should be pointed out that MTI is not alone in its desire to be successful with Stirling engine technology. A DOE Solicitation of Interest for a contractor to compete with MTI recently produced 20 positive replies. The list of attendees at a briefing concerned with this solicitation is attached as Exhibit II. A summary of program activities forms Exhibit III.

Interest is not only in this country. In Europe, Daimler-Benz has a major ongoing effort which is strictly secret, and from which, we have been able to glean little information. In Japan, there is a strong effort ongoing. What information we have on the Japanese effort is shown in Exhibit IV.

EXHIBIT II

INDUSTRY BRIEFING ON ADVANCED STIRLING TECHNOLOGY PROGRAM

September 23, 1980

Attendees

Mr. Richard Tarkir
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Mr. Henry Allen
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Dr. Walter Syniuta
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Mr. Ralph Colello
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Mr. Charles Howard
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Mr. William Beale
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Mr. Craig Kinkelman Sunpower Incorporated 48 West Union Street Athens, OH 45701	Mr. Henry Cuzzolino United Aircraft Products P.O. Box 1335 Dayton, OH 45401	Mr. Donald G. Beremand NASA-LeRC Assistant Manager, Stirling Engine Project Office
Mr. Edward Blackburne Teledyne Continental Motors 76 Getty Street Muskegon, MI 49442	Mr. Robert Pfouts United Aircraft Products P.O. Box 1335 Dayton, OH 45401	Mr. William K. Tabata NASA-LeRC Stirling Engine Project Office
Mr. Theodore Schwallie Teledyne Continental Motors General Products Division 76 Getty Street Muskegon, MI 49442	Mr. Lars Ortegren United Stirling Inc. 211 The Strand Alexandria, VA 22314	Mr. William A. Tomazic NASA-LeRC Stirling Engine Project Office
Mr. Donald Ernst Thermacore Inc. 780 Eden Road Lancaster, PA 17601	Mr. Frederick Dudek Volverine Division of UOP P.O. Box 2202 Decatur, AL 35602	Mr. Gerard Boulanger NASA-LeRC Acquisition Division
Mr. Edward Doyle Thermo Electron Corp. 45 First Avenue Waltham, MA 02154	Robert G. Ragsdale NASA-LeRC Deputy Chief, Transportation Propulsion Division	Mr. Patrick L. Sutton Department of Energy
Dr. Dean Morgan Thermo Electron Corp. 101 First Avenue Waltham, MA 02154	Mr. Frank J. Kutina NASA-LeRC Manager, Stirling Engine Project Office	

EXHIBIT III

KEY ACTIVITY SUMMARY - STIRLING ENGINE (\$23.5M)

KEY ACTIVITY	ESTIMATED ACTIVITIES DURING FY 1981	PLANNED ACTIVITIES DURING FY 1982
Component and Subsystem Development	Initiate fuel nozzle optimization for alternative fuel use.	Complete alternative fuel testing with MOD II combustor.
	Complete engine verification testing of hydrogen gas doping with CO ₂ to significantly reduce hydrogen permeability.	Complete endurance testing of baseline engine with MOD II componentry (seals and materials) at the MOD II operating conditions (8,000 hours total).
ASE MOD I Engine Development	Complete manufacture and delivery of seven engines.	Complete installation of 4 engines in test and demonstration vehicles.
	Initiate engine dynamometer characterization.	Complete engine performance, endurance, and verification testing.
		Initiate vehicle performance/optimization testing with new engines.
ASE MOD II Engine Development	Initiate MOD II engine design.	Complete MOD II engine design based on verified MOD I technology.
		Initiate procurement of long lead items.
Technology Transfer	Complete technology transfer through endurance and characterization testing of baseline P-40 Stirling engine in U.S. test facilities.	Begin MOD I engine characterization in U.S. test facilities.
	Initiate efforts to secure U.S. engine manufacturer.	Complete financial, marketing and licensing studies of Stirling technology.
	Initiate U.S. MOD I engine build utilizing U.S. vendors.	
Stirling Engine Technology Base Enhancement	Award a contract to initiate an advanced alternative Stirling technology base effort.	Continue and Enhance the Advanced Alternative Stirling technology base effort.

EXHIBIT IV

JAPANESE STIRLING ENGINE EFFORTS

Research groups

INSTITUTE	RESEARCH BEING CONDUCTED	LEADER
AISIN SEIKI Co.	Development	S. Haramura
Daihatsu Diesel Co.	Design, Construction	H. Goto
J A R I (Japan Automobile Research Institute, Inc.)	Feasibility study	H. Hayashi
Mechanical Engineering Institute (Agency of Industrial Science and Technology)	Cryo-engine	I. Yamashita
Meiji University	Experimental analysis, Regenerator	H. Miyabe
Mitsubishi Heavy Industries	Heat exchanger, Combustor	T. Kushiyama
Nihon Piston Ring Co.	Piston ring, Sealing mechanism	E. Sugawara
Nissan Motor Co.	Test engine	Y. Hoshino
Ship Research Institute	Dynamics	S. Tsukahara
Tokyo Gas Co.	Feasibility study, heat pump	M. Ogura
Tokyo Institute of Technology	Regenerator	N. Isshiki
University of Tokyo		
Dept. of Mechanical Eng.	Simulation, Experimental analysis	M. Hirata, H. Yoshiki
Dept. of Nuclear Eng.	Design, Test engine, Application	Y. Ishizaki
Yanmar Diesel Co.	Test engine	T. Yamada

In conclusion, Mr. Chairman, the automotive heat engine arena is one in which the stakes concerning the United States are immense. We are locked in competition with highly capable foreign government/industry teams, and the future nation with the best engine option will accrue many billions of dollars in balance of payments, with concurrent impact on employment.

We simply cannot afford to be second.

Industrial Energy Conservation (Recommended - \$120M)

Mr. Chairman, it is becoming a tradition, now, for OMB to make severe cuts in the DOE Industrial Conservation budget. Concurrently, the DOE Industrial Conservation Program continues to be successful at those things for which it was put into place; i.e. - accelerating into use highly beneficial industrial conservation technologies which have previously not been either developed or employed.

In FY '81, OMB followed tradition, cut the DOE Industrial budget request, and it was submitted to congress at \$58.9M. The congress, recognizing the need and benefit of this program, appropriated \$89.7M for FY '81, and inserted into the Energy Security Act an automatic additional authorization for FY '82 of \$40M above the request. With the significant success which has been demonstrated by this program, the strong congressional support which it has received, and the large degree of praise which the private sector has bestowed upon it, it is incredible to see that OMB is suggesting a level of about \$11M for this effort for FY '82. If our nation needs anything, it desperately needs revolutionary improvements in industrial energy productivity, and revolutionary improvements are rarely the province of the private sector.

According to the Department of Energy, the goal of the Industrial Energy Conservation Program is to increase significantly energy end-use efficiency and to substitute abundant, resources for scarce fuels in the industrial/agricultural sector. The estimated annual energy savings of 1.5 quads in 1985 and 5.5 quads in 2000 will be realized. The Federal role, aside from the role of carrying out Congressionally mandated requirements,

is to cost-share research, development and demonstration of new industrial conservation technologies which the private sector, because of risk, cost and other reasons, will not expeditiously pursue alone and which are not adequately stimulated by other conventional Government actions such as regulatory measures and tax incentives. The program also analyzes and takes appropriate Federal actions to stimulate use of existing but underutilized conservation technologies and accelerates the implementation of new and existing technologies. It monitors the progress of the industrial sector in energy conservation.

The industrial/agricultural sector consumes about 37 percent of the total U.S. energy and has generally low energy use efficiencies having been established over several decades of abundant, low cost energy. Industry is reluctant to pursue high risk, high potential technologies on its own. The Industrial Energy Conservation Program focuses on cost-shared development of high impact technologies which are not being pursued by industry for a variety of reasons. These include higher priority demands for capital (EPA and OSHA requirements, market and product development, etc.), the fact that energy is a small percentage of product costs, and risk of slowdown or failure of new processes. The funded activities of the Program are carefully screened and prioritized to assure non-redundancy with efforts being conducted by private industry on its own.

During the past year, the Department has published a large number of achievements for this program. I urge you to request that these be made a part of the record.

Mr. Chairman, each success that has been shown by this program clearly demonstrates those elements which the country desperately needs:

- 1) Each success accelerates an energy saving technology into service, thus lessening our nation's dependence on foreign oil;
- 2) Each success enables industry to compete more successfully in the international marketplace, thus improving our balance of payments;

and

- 3) Each success results in an expanding business, thereby expanding American employment (i.e. - reducing unemployment).

In 1982, full funding of this program will allow the originally planned efforts to take place in a timely fashion, and will allow the continuation of those efforts which are to be initiated under the FY '81 appropriation. The complete list of efforts, project descriptions, and national benefit should be requested from the Department of Energy at the \$120M level.

Energy Conversion and Utilization Technologies (Recommended Level - \$15M):

Finally, Mr. Chairman, I would like to address a program element known as ECUT, the Energy Conversion & Utilization Technologies. This is a fledgling program addressing the basic technologies needed to bridge the gap between basic research and prototype development in the end-use sector. MTI is very familiar with the benefits of a strong program in this area since our high efficiency, high reliability equipment product lines have evolved from such technologies.

In order to evolve technologically superior products with which to compete internationally, a "technology flow" needs to be established such as that which is present in the Department of Defense, or provided by NASA. This "technology flow" involves basic research to examine fundamental concepts, exploratory development to test component concepts in a laboratory, advanced development to evolve first working prototypes, engineering development to take first prototypes into production design, and finally, production. In the DOE technology programs supporting conversion equipment, the exploratory development has been largely missing. The ECUT program was put into place to enable the full technology flow to occur in the energy-efficient equipment arena. As opposed to the \$15M which this program requires in FY 1982, the Department of Defense effort in this area is on the order of \$1 billion, supporting defense needs in military equipment.

In this program, Mr. Chairman, a detailed examination of each small technology effort would not produce a high degree of understanding, except

to a well-educated engineer. Therefore, I will close my supporting statement of this program simply by saying that such focused technology efforts have paid many dividends in the aerospace and defense fields. We need them in the energy conversion equipment arena.

CONCLUSION:

Mr. Chairman, this year is critical, in the authorization/appropriations process, to the future capability of the nation to compete broadly, internationally, in the energy conversion equipment arena. Balance of payments, jobs, and capital availability will all be markedly effected by the choices which the congress makes. Budgets certainly must be formed to be within our national capability to finance them, but when federal investments are made, they must be made through careful analysis with the national benefit firmly in mind. Any other approach would be a national disaster.

It is no secret to any of the members of this committee that the strength of our government lies in the fact that it is participatory in nature. A great deal of input from the private sector has gone into appropriations decisions in the energy arena in the past. This process has led to a broad range of fledgling options with a great deal of promise for future national benefits. We simply cannot afford to devastate these options categorically.

I thank you for the opportunity to express these opinions.

OPENING REMARKS

Mr. LAWRENCE. I would like to add our support to the words of Dr. Hatsopoulos and I am also going to address a similar subject in a little different manner. The subject that I want to address is the conservation technology programs within the Department of Energy that according to the newsletters will be zeroed in in fiscal year 1982 and many ongoing programs terminated between now and then.

Many times in past years before this subcommittee, the national benefit of these programs has been expressed and has been made part of the record. These programs include the industrial conservation program, the heat pump programs and the automotive heat engine programs that are part of the transportation budget in the Department of Energy.

Now what I would like to do this morning since the national benefit has been explained in terms of such things as barrels per day, say, and lower cost to the consumer of achieving their needed various energy needs, what I would like to do is give you a kind of a brief overview of the situation today as we see it and then hone in on a couple of the key program areas.

First of all, it is very clear that foreign industry/government teams are continually eroding our marketplace. These are very carefully focused on characteristics. First of all, there are multibillions of dollars in nature or even multi-tens of billions in the case of the automotive market.

Secondly, they are focused on energy efficient equipment, everything from solid state electronics which use much more energy right up through automotive engines and a lot of other things in between, industrial equipment, heating and cooling equipment, refrigeration equipment.

The third characteristic they focused on is high volume of unit sales which relates directly to employment.

Now if you are successful in focusing a government/industry team on such an area in the international marketplace and your country is successful then in market dominance, what happens? First of all, your nation has less requirement for oil imports due to the implementation of higher efficiency equipment. You need less energy to provide you with that for the heat, cooling, flight, and automotive transportation.

Secondly, it has a major positive effect on the balance of payments in a nation which is dominant in these multibillion dollar markets. As you know, we have lost \$127 billion in our balance of payments overseas in the past five years and we are looking to \$30 billion in balance of payments in 1981 overseas.

Next, the influx of capital into those industries that are competing successfully in these markets that enable them to carry out R&D and to improve their products, thus enabling further expanding in these marketplaces.

Finally, if you are successful in knowing this, it has a major positive effect on employment.

If I could mention, since Dr. Hatsopoulos mentioned it, the industrial programs, that in 1982 we received virtually no vested interest for ourselves in a strong industrial conservation program. We will compete if the program exists but right now we see a minimum or our own vested interest. However, the national interest in

that program I cannot overemphasize because even if we are successful in giving industry the capability to put new production facilities in place and these kinds of things, that is only half of the coin. The other half is having the technology in the form of prototype equipment available so that when you put your production in place you are able to compete in the international marketplace. New production of obsolete equipment does absolutely nothing for you.

The DOE program of industrial conservation has characteristically shown that it is extremely capable of bringing the revolutionary technologies into the marketplace in this country. That is a very, very key and political point.

HEAT PUMP PROGRAM

The next thing very briefly, the heat pump area. According to the energy newsletters, and I have no reason to disbelieve them, the heat pump program will go to zero in 1982 at a point where we have yet to put the first prototypes in the field. Now while this is going on the Japanese have given to the American gas industries first off a kind of gas-fired heat pump for their use in their field test. So while our government is backing away and the industry is incapable of going ahead with it as Dr. Linden said, what we said is the Japanese are moving into a high volume, high efficiency, high unit sales energy conversion equipment market again and focused government/industry action.

AUTOMOTIVE HEAT ENGINE PROGRAM

Let me talk briefly about the automotive heat engine program. I want to back that up with some of the information that is in the handouts that have the brief exhibits. If I could point out table one in the handouts and talk briefly about what we mean here, table one is from the Department of Transportation report in January 1981, the final report of Mr. Goldschmidt as he left office. Table one was taken, as you can see, from a wide variety of references and that shows, if you look at the last two columns and look at just automotive engines that will be coming into domestic cars, American cars with foreign made engines in 1980, we are looking at about 800,000 foreign made engines going into American cars.

In 1983 we have already made commitments to put approximately four million engines into American made cars.

Now if you add that to the minimum two million foreign cars that will be in this country with foreign made engines, you will wind up with six million engines in a ten million car marketplace, approximately. These engines will have a value in that time period 1983 of about a thousand dollars an engine. That is a \$6 billion negative balance of payments deficit just due to automotive engines and the fact that we don't have the viable capability in this country to produce those in competition with our foreign outlets.

Now what that translates to in employment at the first level is some place between 150,000 and 175,000 people employed and whatever the economists want to multiply that by for the total effect is something on the order of 250,000 to 400,000 people. That is jobs. So that is what we are talking about when we talk about having a viable technology and production capacity at the same time.

Mr. LOEFFLER. Might I interrupt you, Dr. Lawrence, and ask you

why is it that we cannot compete with the production of the German or Japanese engine?

Mr. LAWRENCE. Mr. Chairman, I think that what has happened is the Japanese and the Germans have emulated our success in the military and the aerospace field where we have focused government/industry togetherness where the government helped supply the technology up through prototypes and industry has done the more promising ones and put them into production and has dominated the international marketplace. Our German and Japanese allies saw this and realized that by focusing their activities in the automotive industry in a similar fashion where the government provides all the technology support necessary to evolve these high quality options and then the industry provides the manufacturing capability to get them out of the marketplace and compete, and they have managed to knock us out of the marketplace.

Mr. LOEFFLER. What would they propose regulatory relaxation would do in that kind of an arrangement?

Mr. LAWRENCE. Well, I obviously can't speak for the automotive industry in the United States but as a businessman if I were in the automotive industry and faced with a choice of investing great quantities of my own money to do R&D on a product which when I was finished might be three years behind a product that I can already buy from the Japanese or the Germans, I would buy it from the Japanese or the Germans. There would be no reason to go ahead and do it yourself in this country. I think that what we have to face is the fact that if we are going to be competitive in the international marketplace we have to utilize the experience that we have gained in NASA and the military and we have to have the government involved with not just product improvement R&D but the high risk R&D to have success in the marketplace. They are high risk and that is why industry is not going to run out and do it themselves but we have to have something there in order to keep our people employed and competitive in the international marketplace.

Go ahead and buy these options in foreign markets that are a better option than we have in this country now. At least the most advanced business sense would go ahead and proceed that way. I would be the last one to criticize them in a profit fashion for operating like that.

STIRLING ENGINE PROGRAM

Very quickly, I am almost out of my ten minutes, I would like to talk to you about our automotive Stirling engine program which is part of the DOE heat engine program which again according to the press will be terminated for fiscal year 1982 and in fact will be phased out in fiscal year 1981. After three years in that program, Mr. Chairman, we are on schedule, we are under cost and we have every reason to believe that we will meet the requirements of the 1978 Automotive Propulsion R&D Act which is to have in 1983 an engine capable of more miles per gallon and meeting the 1985 emission standards and running more efficiently.

The next handout shows what we are projecting as miles per gallon based on our designs which are now in design stage. Again we have operated these engines already interchangeably with gasoline, diesel fuel and alcohol. We have beaten them in our very first

prototypes. We have already beaten the original mileages and we are moving now towards something that will in fact beat the miles per gallon significantly while obtaining the necessary efficiency.

The final exhibit in your little handout shows the Japanese and their interests in the Stirling engine effort. This comes from a 1979 publication and it is the only place where we have been able to find this published. I can assure you that in the last two years they accelerated their efforts. It is 50 horsepower operating at 30 percent efficiency which is virtually the equivalent of what we have in this country.

That ends my testimony.

Mr. LOEFFLER. Thank you, Mr. Lawrence.

Mr. LAWRENCE. Thank you.

FUEL CELL USERS GROUP

DOE—FOSSIL ENERGY-FUEL CELLS

WITNESSES

ERIC LEBER, CHAIRMAN OF THE GOVERNMENT AFFAIRS SUBCOMMITTEE OF THE FUEL CELL USERS GROUP OF THE ELECTRIC UTILITY INDUSTRY AND DIRECTOR OF ENERGY RESEARCH FOR THE AMERICAN PUBLIC POWER ASSOCIATION

ANN HEGNAVER, PROGRAM MANAGER, FUEL CELL USERS GROUP

LOWELL ENDAHL, COORDINATOR FOR RESEARCH AND DEVELOPMENT, NATIONAL RURAL ELECTRIC COOPERATIVE ASSOCIATION

Mr. LOEFFLER. Fuel Cell Users Group, Mr. Leber.

Without objection, your statement will be made part of the record.

Mr. LEBER. Thank you.

[Material follows:]

STATEMENT ON THE FY 1982 FUEL CELL BUDGET
OF THE DEPARTMENT OF ENERGY

Presented to
THE SUBCOMMITTEE ON INTERIOR
of the
HOUSE COMMITTEE ON APPROPRIATIONS
by the
FUEL CELL USERS GROUP OF THE ELECTRIC UTILITY INDUSTRY
February 19, 1981

Mr. Chairman and members of the Committee, my name is Eric Leber. I am Chairman of the Government Affairs Subcommittee of the Fuel Cell Users Group of the Electric Utility Industry and Director of Energy Research for the American Public Power Association. Accompanying me today is Lowell Endahl, also with the Government Affairs Subcommittee and Coordinator for Research and Development at the National Rural Electric Cooperative Association, and Ann Hegnauer, Program Manager for the Fuel Cell Users Group.

We have come here today because: (1) the fuel cell has the potential to become a source of electrical and thermal energy that has significant environmental, economic, and efficiency advantages over conventional generation equipment—conceivably, it could revolutionize the energy industry the way solid-state components changed the electronics industry; (2) there remain significant technical, operational, and economic questions about the fuel cell that have yet to be fully addressed in laboratory or field experiments; and (3) we'd prefer to buy American made fuel cells (Several foreign companies are aggressively pursuing this technology.). On these grounds, we—representing prospective users of fuel cells—believe that a broadly based, broadly supported* program to prove out the capabilities of this energy option within the next five years would be fully consistent with our national priorities of energy self-sufficiency, economic well-being, and environmental health. Accordingly, we suggest that \$30 million for the Department of Energy's phosphoric acid fuel cell program would be the appropriate federal share in this effort in fiscal year 1982. (The DOE request for this item is \$10.1 million, less than half the amount this Committee approved for FY 1981.)

ANTICIPATED FEATURES OF THE FUEL CELL

In today's typical generating station the thermal energy of combustion or fission is used to heat water to steam which subsequently drives a turbine which is connected to an electrical generator. The fuel cell, however, produces power through an electrochemical process which directly taps the chemical energy of the fuel, rather than being subject to the inherent efficiency limitations of the Carnot cycle. Accordingly, generation efficiencies of 41% to more than 50% are to be expected for the fuel cell (in contrast to 28% to 38% for thermal power plants), thus making it relatively fuel conservative. The fuel cell also

*Over the course of its 14-year history, the U.S. fuel cell program has received broad support—65% of the total funding to date has come from the private sector (manufacturers, the Electric Power Research Institute, utilities, and others).

operates efficiently at partial loads, which allows the utility to use this versatile system in a load-following mode as a substitute for peaking equipment.

By virtue of its environmental acceptability and modular construction, the fuel cell will be relatively easy to site. We expect the fuel cell emissions of oxides of nitrogen and sulfur and particulates will be at least a factor of ten below what is currently attainable from fossil fuel plants, that noise levels will be low (about 55 decibels at 100 feet), and that water use will be negligible. The modest land requirements (roughly 2,400 square feet for a utility-scale facility) and prefabrication of major components, moreover, will allow installation and operation on a two-year time scale. Thus, the fuel cell affords a utility the advantages of planning flexibility and local siting.

Locating the fuel cell near the consumer has several benefits: (1) reduced requirements for long-distance power transmission and distribution; (2) relative proximity to fuel supply, transportation networks, and other services; and (3) capability for cogeneration and waste-heat utilization.

A by-product of a fuel cell's operation is waste heat which typically would be rejected by dry cooling systems. However, fitted with equipment to recover reject heat, fuel cell power plants can supply steam or hot water for process industries and building heating systems. Overall fuel conversion efficiencies (thermal plus electric) of 80% are possible utilizing fuel cells in this manner. As a cogeneration plant, a fuel cell could be operated in either a thermal dispatch mode (to meet steam loads) or an electrical dispatch mode (to meet electrical loads). Given its siting flexibility, the fuel cell appears particularly attractive for cogeneration applications in urban, industrial areas where there are uses for the steam and hot water and where the use of natural gas or light distillate is necessary.

First generation fuel cells will be able to use petroleum or coal-derived distillates, natural gas, methane, coal gas, synthetic natural gas, or fuel grade methanol having a sulfur content of less than about 500 ppm and an end boiling point of about 450°F. These fuels include methane-rich gases which might be produced from landfills, sewage, feedlot wastes, abandoned coal mines, vegetable matter, and other unconventional sources. The fuel cell's capability for being installed in relatively small capacity increments and siting in a variety of environments could enable it to use methane derived from such sources as either a primary or supplemental fuel.

THE FUEL CELL USERS GROUP

The Fuel Cell Users Group of the Electric Utility Industry is a comparatively new (about a year old) organization with 43 members—prospective users of the fuel cell—whose primary purposes are:

- To encourage the development of fuel cells by interactions with the utility industry, government agencies, developers, and others.
- To coordinate, cooperate, and exchange information within the utility industry and with other public or private organizations concerned with the development and utilization of fuel cells.

- To provide a coordinated body through which members of the Group may cooperatively identify, sponsor, support, and participate in research, development, engineering demonstration, and utilization of fuel cell energy systems.
- To provide a body of potential users to assist the fuel cell developers in defining (a) fuel cell system requirements and specifications for electric utility application, and (b) the market potential for fuel cell systems having said specifications.

The Users Group is quite broadly based, encompassing utilities of all sizes (members are listed in Attachment 1). Thirty-eight utilities are charter members, about half being public power and rural electrification systems. The other five members include the associations represented here today, plus the Rural Electrification Administration and the Tennessee Valley Authority. Geographically, the members range from Oregon to Pennsylvania and from Minnesota to Mississippi. These are, of course, only the charter members; we expect the list to grow as the Group furthers its efforts.

Although the Fuel Cell Users Group is designed primarily to work on commercialization issues, successful commercialization depends on successful conclusion of technology research and development efforts.

BUDGET CONSIDERATIONS

Mr. Chairman, the staff and members of the Users Group have deliberated long and hard over the question of FY 1982 funding for the phosphoric acid fuel cell program.

Our initial estimates for a program that would retain the pace and continuity required to develop this technology to commercial readiness were on the order of \$50 million. This was the figure that was communicated to former Secretary of Energy Duncan in letters from Mr. Charles Luce, Chairman of the Users Group, and Mr. Harvey Proctor, Chairman of the On-Site Fuel Cell Users Group of the Gas Utility Industry. This was also the funding level transmitted more recently in correspondence from myself to Mr. Michel Halbouty of the DOE Transition Team for then President-elect Reagan. Copies of these documents are attached for the Committee's consideration (Attachments 2 and 3).

In view of the widespread interest in cutting federal spending, we have taken a hard second look at the phosphoric acid fuel cell numbers in the hope of cutting our proposed budget figures without killing the program's momentum and the leadership position that the U.S. presently enjoys in the development of this technology.*

Our revised request is \$30 million. This represents a minimum level of effort, sufficient to retain some semblance—though introducing a three-year delay—of the program plan defined by the National Fuel Cell Coordinating Group and encouraged by this Committee in its Report on the Department of Energy's

*Three Japanese firms—Fuji, Hitachi, and Sanyo—are now aggressively pursuing the development of utility and residential fuel cells. Other foreign companies with some level of activity in this field are: Toshiba, Telefunken, Brown Boveri, and Siemens.

budget for FY 1980. The present DOE request of \$10.1 million represents an abandonment of the plan. Thirty million dollars would permit utility fuel cell technology development and testing to continue and provide sufficient resources to pursue competitive options and alternative applications for the utility fuel cell.

UTILITY INTEREST

Mr. Chairman, as detailed in Attachments 4 through 6, utility interest in this clean, efficient, and modular source of electrical and thermal energy remains high. In the past month, I've been contacted by utilities in Utah, Maryland, Colorado, and Alaska expressing their willingness to participate in the advancement of this technology, and the American Public Power Association has recently let a contract with the engineering firm of Burns and McDonnell to analyze specifically the potential of a fuel cell demonstration in a locally owned utility. The conclusions of the firm's preliminary draft are:

"Fuel cell power plants are a promising potential source of electric power for locally owned utilities. If currently envisioned commercialization schedules are met, fuel cell manufacturers may be ready to take orders for first generation plants by 1984 for deliveries of equipment by 1986. However, questions remain concerning the technical, operational, and economic feasibility of such plants. In order for manufacturers to develop viable commercial fuel cell power plants for application in the locally owned utility market and in order for locally owned utilities to be encouraged to undertake the costs associated with investing in this new technology, it is important that advanced prototypes of fuel cell plants be demonstrated at locally owned utilities. In order to hasten the commercial availability of fuel cell power plants to locally owned utilities, it is important that such a demonstration be pursued expeditiously. It would be desirable to have preliminary results of a demonstration available by the latter part of 1984 or early 1985. To achieve this goal, it is important that a demonstration program be implemented as soon as possible."

Preparation of a similar document focusing on the fuel cell in the rural electric sector is presently proceeding under the sponsorship of the National Rural Electric Cooperative Association (NRECA). When they become available, final copies of these reports will be forwarded to the Committee.

Further, less than a month ago the membership of the NRECA reaffirmed their interest in the development of the fuel cell by approving a resolution that calls for federal support for a "comprehensive integrated program" for fuel cell power plant development.

CONCLUSION

In summary, we find that the fuel cell's promise is extraordinary; the proof of its attractive characteristics (of fuel flexibility, reliability, efficiency, environmental acceptability, economic viability, etc.) continued to elude us, however. It's not too far fetched to suggest that the fuel cell could radically change—for the better—the way we obtain critical energy services in this country. So it's not inconsistent to ask for such a modest federal expenditure (\$30 million is less than one-half of one percent of the total FY82 DOE energy budget) to advance this energy system that offers so much so soon for the American public. Thank you for the opportunity to present these remarks.

FUEL CELL USERS GROUP MEMBERS

Federal Government

Rural Electrification Administration (REA)
Tennessee Valley Authority (TVA)

Cooperatives

National Rural Electric Cooperative Association (NRECA)
Seminole Electric Cooperative, Florida
Lee County Cooperative, Florida
Allegheny Electric Cooperative, Pennsylvania
Hoosier Energy Division, REC, Inc.
Adams Electric Cooperative, Pennsylvania
Basin Electric Power Cooperative, North Dakota
United Power Association, Minnesota

Non-Federal Government Utilities

American Public Power Association (APPA)
Taunton Municipal Lighting Plant, Massachusetts
Tacoma, Washington
Martinsville, Virginia
Easton Utilities Commission, Maryland
Santa Clara Electric Department, California
Seattle City Light, Washington
Memphis Light, Gas and Water, Tennessee
Lincoln Electric System, Nebraska
Massachusetts Municipal Wholesale Electric Company (MMWEC)

Investor-Owned Utilities

Edison Electric Institute (EEI)
Consolidated Edison Company of New York
Arizona Public Service Company, Arizona
Carolina Power and Light Company, North Carolina
Ohio Edison Company, Ohio
Boston Edison Company, Massachusetts
Niagara Mohawk Power Corporation, New York
Portland General Electric Company, Oregon
Northern States Power Company, Minnesota
Mississippi Power and Light Company, Mississippi
Southern California Edison Company, California
Philadelphia Electric Company, Pennsylvania
Green Mountain Power Corporation, Vermont
Northeast Utilities Service Company, Connecticut
Public Service Electric and Gas Company, New Jersey
Central Hudson Gas and Electric Corporation, New York
Idaho Power Company, Idaho
Baltimore Gas and Electric Company, Maryland
Dayton Power and Light Company, Ohio
Central Illinois Light Company, Illinois

Foreign

Ontario Hydro, Canada
Hydro Quebec, Canada
Tokyo Electric Power Company, Japan

Charles F. Luce
Chairman of the Board

Consolidated Edison Company of New York, Inc.,
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October 3, 1980

The Honorable Charles W. Duncan, Jr.
Secretary
U.S. Department of Energy
1000 Independence Avenue, S.W.
Room 7A-257
Washington, D.C. 20585

Dear Secretary Duncan

Within the past year over 75 electric and gas companies have formed respective Fuel Cell Users Groups to expedite the development and commercialization of phosphoric acid fuel cell (PAFC) power plants. The strength of our interest in fuel cells is reflected in the breadth of our membership. Investor-owned, rural cooperative, and municipal utilities, as well as inter-state pipeline companies and gas distribution companies are working together to achieve this objective. The current membership lists accompany this letter.

Our interest in fuel cell power plants derives from their intrinsic advantages, including:

- o High fuel efficiency. If used in a cogeneration or dual energy use mode overall efficiency of over 80% can be expected.
- c Virtually pollution free -- allowing siting near the user of electricity and thermal energy.
- o Modular, factory assembled units, allowing short planning lead times -- a critical necessity in times of load growth uncertainty.
- o Fuel flexibility -- can be in use before synthetic fuels are generally available, but are easily adaptable to the range of synthetic fuels the nation's energy policy envisions.

Fuel cell power plants will, with continued support, be commercially available within the next few years. Other new generating technologies won't be ready for many years. The private sector has therefore joined together to speed the commercial use of this unique power generator that can be expected to reduce America's dependence on imported oil while meeting the most rigid environmental constraints.

The electric and gas companies are pursuing PAFC power plants for two related but different roles. The first role, of interest to gas companies and gas-electric (combination) utilities, is that of small (40-300kW) on-site generators located in commercial and multifamily residential buildings. Such a plant, using pipeline gas as a fuel, could supply both electric and thermal energy consuming no more fuel than that now required for thermal demand alone. The second role, of interest to electric utilities, is that of multimegawatt dispersed generators located on the utility grid with the potential for waste heat recovery. These generators could use available liquid or gaseous fuels more efficiently and cleanly than any alternative peaking or load following generator.

Over the past sixteen years, the electric and gas companies along with their respective research institutes (EPRI and GRI) have invested over \$150 million in PAFC power plant development. The levels of interest and financial support continue to grow.

In contrast, DOE support has been disappointing and has stood in sharp contrast to the interest and intent of the Congress. For instance, in FY1980 DOE's original PAFC request to OMB was \$0 while Congress appropriated \$23.5 million; and in FY1981 DOE requested \$11 million for PAFCs while Congress will likely appropriate twice that amount.

As we look toward the FY1982 DOE budget, the problem could become severe. Both the on-site and dispersed PAFC fuel cell programs are at critical stages of development and demonstration. To keep these programs on schedule will require FY1982 DOE appropriations of \$21 million and \$29 million for the on-site and dispersed generator programs, respectively. This level

of support will sustain the major demonstration efforts with United Technologies Corporation, which has already made substantial investments in this technology. It will also provide the technology support base for evolutionary improvement and will begin to encourage competition from other qualified developers. Westinghouse and Engelhard are presently making significant investments to establish and qualify commercial configurations.

We strongly encourage you to join America's electric and gas companies and the Congress to provide adequate support for these important programs.

Sincerely

Charles F. Luce

Charles F. Luce
Chairman
Fuel Cell Users Group
of the Electric Utility Industry

SOUTHERN CALIFORNIA GAS COMPANY



HARVEY A. PROCTOR

Chairman of the Board

910 SOUTH FLOWER STREET • LOS ANGELES, CALIFORNIA

Mailing Address BOX 3249 TERMINAL ANNEX, LOS ANGELES, CALIFORNIA 90051

October 7, 1980

The Honorable Charles W. Duncan, Jr.

Secretary

U. S. Department of Energy

1000 Independence Avenue, S.W.

Room 7A-257

Washington, D. C. 20585

Dear Mr. Secretary:

Within the past year, over 75 electric and gas companies have formed respective Fuel Cell Users Groups to expedite the development and commercialization of phosphoric acid fuel cell (PAFC) power plants. The strength of our interest in fuel cells is reflected in the breadth of our membership. Investor-owned, rural cooperative, and municipal utilities, as well as interstate pipeline companies and gas distribution companies are working together to achieve this objective. The current membership lists accompany this letter.

Our interest in fuel cell power plants derives from their intrinsic advantages, including:

- High fuel efficiency. If used in a cogeneration or dual energy use mode, overall efficiency of over 80% can be expected.
- Virtually pollution-free -- allowing siting near the user of electricity and thermal energy.
- Modular, factory assembled units, allowing short planning lead times -- a critical necessity in times of load growth uncertainty.
- Fuel flexibility -- can be used before synthetic fuels are generally available, but are easily adaptable to the range of synthetic fuels the nation's energy policy envisions.

Fuel cell power plants will, with continued support, be commercially available within the next few years. Other new generating technologies won't be ready for many years. The private sector has, therefore, joined together to speed the commercial use of this unique power generator that can be expected to reduce America's dependence on imported oil while meeting the most rigid environmental constraints.

SOUTHERN CALIFORNIA GAS COMPANY

The Honorable Charles W. Duncan, Jr.
Secretary, U. S. Department of Energy

2.
October 7, 1980

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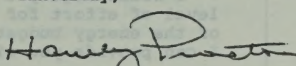
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As we look toward the FY 1982 DOE budget, the problem could become severe. Both the on-site and dispersed PAFC fuel cell programs are at critical stages of development and demonstration. To keep these programs on schedule will require FY 1982 DOE appropriations of \$21 million and \$29 million for the on-site and dispersed generator programs, respectively. This level of support will sustain the major demonstration efforts with United Technologies Corporation, which has already made substantial investments in this technology. It will also provide the technology support base for the evolutionary improvement and will begin to encourage competition from other qualified developers. Westinghouse and Engelhard are presently making significant investments to establish and qualify commercial configurations.

We strongly encourage you to join America's electric and gas companies, and the Congress to provide adequate support for these important programs.

Sincerely,



Harvey A. Proctor
Chairman, On-Site Fuel Cell Users Group
Of The Gas Utility Industry

Enclosure

THE FUEL CELL USERS GROUP

OF THE ELECTRIC UTILITY INDUSTRY

1101 Connecticut Avenue, NW
Suite 705
Washington, DC 20036
202/457-0868

November 25, 1980

DIRECTORATE

Charles F. Luce
Chairman of the Board
Consolidated Edison
Chairman

William H. Corkran, Jr.
General Manager
Eaton Utilities Commission
Vice Chairman

Richard C. Clancy
Senior Vice President
Niagara Mohawk Power Corporation

Robert W. Fennigan
Administrator
Rural Electrification Administration

Barry R. Flynn
Director of Electric Utilities
City of Santa Clara Electric Department

Richard M. Freeman
Director
Tennessee Valley Authority

William R. Gould
President
Southern California Edison Company

Donald C. Lurken
President
Mississippi Power and Light Company

William F. Mason
Executive Vice President and General Manager
Allegheny Electric Cooperative, Inc.

William McGowan, Jr.
President
Edison Electric Institute

Robert D. Partridge
Executive Vice President and General Manager
National Rural Electric Cooperative Association

Alex Rabin
Executive Director
American Public Power Association

Zelan F. Sillin, Jr.
Chairman and Chief Executive Officer
Northeast Utilities Service Company

Robert J. Smith
Chairman of the Board
Public Service Electric and Gas Company

Frank M. Warren
Chairman and Chief Executive Officer
Portland General Electric Company

Robert A. Bell
Assistant Vice President
Consolidated Edison
Chairman, Management Committee

Robert W. Fri
President
Energy Transition Corporation
Executive Director

Mr. Michel T. Halbouty
Department of Energy
Transition Team
1000 Independence Ave., S.W.
Room 7B084
Washington, D.C. 20585

Dear Mr. Halbouty:

Nearly a year ago, prospective electric utility users of the phosphoric acid fuel cell established the Fuel Cell Users Group. Comprised of representatives of investor-owned, Federal, and locally owned utilities, and rural cooperatives, the Users Group has near-term commercialization of the fuel cell technology as its highest priority. Information on the many attractive features of the fuel cell (high-efficiency, cogeneration potential, short lead-time, ease of siting, modularity, environmental acceptability a degree of fuel flexibility, etc.) and a brochure on the Users Group are attached for your consideration.

The Office of Management and Budget's recommendations for FY82 fuel-cell funding are appalling. The approximately \$29 million mark contains virtually nothing for the electric utility fuel-cell effort and only \$10 million for the on-site program. To bring the fuel cell to commercial viability in the near future and promote significant competition in its domestic manufacture, the electric utility (multi-megawatt) and on-site (multi-kilowatt) programs should receive about \$29 million and \$21 million, respectively. (There is increasing evidence that Japanese manufacturers are considering entering the market as producers of fuel cells, a prospect that has significant domestic and international implications.)

I would urge you to consider enhancing the level of effort for the fuel cell in your review of the energy budget for the forthcoming year. If I can provide you with any additional information,

Mr. Halbouty

-2-

Nov. 25, 1980

please contact me at the American Public Power Association
(342-7226).

Best wishes.

Sincerely,

ERIC LEBER

Eric Leber
Chairman,
Committee on Government
Relations

REL:bo

cc: Mr. Richard Fairbanks
Mr. Thomas Peacock
Mr. Glenn Schleede

Sincerely,

THE EASTON UTILITIES COMMITTEE
11/25/80

Bice
William H. Bice, Jr.
General Manager



Provo City Power

251 WEST 800 NORTH / P.O. BOX 658 / PROVO, UTAH 84601 / TELEPHONE: 373-7170

January 27, 1981

Dr. Eric Leber
American Public Power Association
2600 Virginia Avenue NW
Washington, D.C. 20037

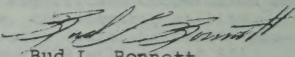
Dear Eric:

In reference to your letter, dated January 15, 1981, Provo City Power is definitely interested in the fuel cell demonstration at our local utility. We would like as much additional information on the project as possible.

The fuel cell is a very interesting source of new energy and could be tied to our hydrogen study that we are now involved in.

Please feel free to contact George Morse, our Engineering Project Supervisor, if he can be of any assistance to you in this matter.

Sincerely,


Bud L. Bonnett
Director

BLB/sy



THE EASTON UTILITIES COMMISSION

11 SOUTH HARRISON STREET, EASTON, MARYLAND 21601

301-822-6110

January 23, 1981

Dr. Eric Leber
 Director of Energy Research
 American Public Power Association
 2600 Virginia Avenue N.W.
 Washington, D.C. 20037

Dear Eric:

I have your letter of January 15, 1981 in which you inform us that our Utility would be a strong candidate for a fuel cell demonstration.

This is certainly great and exciting news!

May I take this opportunity to inform you that we at the Easton Utilities Commission are extremely interested in the prompt pursuit of the question of a fuel cell demonstration here in Easton, Maryland.

We look forward to an early demonstration of the fuel cell.

Sincerely,

THE EASTON UTILITIES COMMISSION

Bice

William H. Corkran, Jr.
 General Manager

WHC/nms



George M. Sullivan
Mayor

Municipal Light & Power

1200 EAST FIRST AVENUE - ANCHORAGE, ALASKA 99501
TELEPHONE (907) 279-7671



February 4, 1981

R. Eric Leber, Ph.D.
Director of Energy Research
American Public Power Association
2600 Virginia Avenue, N.W.
Washington, D.C. 20037

Dear Doctor Leber:

Municipal Light and Power would be interested in the Fuel Cell demonstration project. We did investigate applying in an earlier demonstration program but at that time they were looking at liquid fuels which were not locally available and extremely expensive compared to natural gas. As long as the emphasis is on natural gas as the primary fuel, we would be interested.

Our other area of concern relates to the permanency of the installation; this aspect is critical if the waste heat from the fuel cell is to be utilized.

Thank you for advising us of this new demonstration project and please provide us with the information necessary to determine a specific application.

Very truly yours,

Thomas R. Stahr
General Manager
Municipal Light and Power

TRS/slg

PRELIMINARY

FEB 13 1981

The Need for a Fuel Cell Power Plant Demonstration Among

Locally Owned Utilities

Prepared for

American Public Power Association

Burns & McDonnell
ENGINEERS - ARCHITECTS - CONSULTANTS

SUMMARY

The fuel cell power plant is a promising advanced power generation concept. The fuel cell is of interest to locally owned utilities because of a number of unique features which could enable such power plants to compete economically and operationally with conventional power sources while saving natural gas and oil and reducing environmental impacts. Among the features of fuel cell power plants are their:

- High Efficiency
- Load Following Capability
- Environmental Compatibility
- Modular Design
- Siting Flexibility
- Cogeneration Potential
- Fuel Flexibility
- Reliability
- Fuel Use Act Exemption

Because of these features, fuel cells have the potential for serving locally owned utilities in several ways. Initial fuel cell power plants, because of their dependence on liquid and gaseous fuels, are expected to be used by locally owned utilities primarily as either peaking or intermediate duty generators (peak shaving role) or in cogeneration or building heating system applications. Advanced fuel cells integrated with coal gasifiers and some first generation fuel cells, utilizing unconventional fuels (produced from landfills, sewage, feedlot wastes, abandoned coal mines, vegetable matter, etc.), could also operate as base load plants. The feasibility of utilizing fuel cell

power plants will, of course, vary with the power supply situation of a given locally owned utility.

Developed in small modules and sited near load centers, fuel cell power plants are expected to provide the following benefits to utilities:

- Lower power supply costs
- Reduce capital requirements
- Reduce power transmission related costs
- Lessen environmental impacts
- Conserve fuel
- Improve power system operations
- Improve power system reliability

If currently envisioned schedules are met, fuel cell manufacturers possibly may be ready to take orders for first generation plants by 1984 for deliveries of equipment by 1986. However, questions remain concerning the technical, operational, and economic feasibility of such plants. The two 4.8-MW power plant demonstrations in progress in New York City and Tokyo will not be able to answer these questions, particularly as they apply to locally owned utility systems which have their own unique requirements and circumstances. In addition, the prototypes of plants planned for commercialization are expected to be larger, more efficient, and have improved stack life compared to the 4.8-MW plants. In order for manufacturers to develop viable fuel cell power plants for application in the locally owned utility market and in order for locally owned utilities to be encouraged to undertake the costs associated with investing in this new technology, it is important that advanced prototypes of fuel cell plants be demonstrated at locally owned utilities. In order to hasten the commercial availability of fuel cell power plants to locally owned utilities, it is important that such a demonstration be pursued expeditiously. It would be desirable

to have preliminary results of a demonstration available by the latter part of 1984 or early 1985. To achieve this goal, it is important that a demonstration program be implemented as soon as possible.

The federal government should adopt the leading role in the demonstration program since a significant amount of federal funding will be required. It can be anticipated that the total funding required would be in the range of \$35 million or more depending upon the number of demonstration plants constructed and other factors. A significant percentage of the funding would need to come from the federal government with the balance being contributed by the host utility, the fuel cell manufacturer, and other interested organizations. The involvement of the federal government in the program is important because of the substantial costs and risks associated with such a demonstration both for the host utility and the fuel cell manufacturer. It is also appropriate for the federal government to undertake the lead responsibility of such a demonstration because of the considerable future benefits which this technology offers to electric utilities and their consumers throughout the United States. For these same reasons, it is also important that a demonstrations program sponsored by the federal government be supported by the locally owned utilities themselves, manufacturers, and other organizations pursuing the development of the fuel cell technology for electric utility use.

A site or sites for the demonstration would be selected from competitive proposals selected from prospective host utility/fuel cell manufacturer teams. To maximize the value of the information developed in the demonstrations, preferred applications would be those involving cogeneration and/or unconventional fuels.

NATIONAL RURAL ELECTRIC COOPERATIVE ASSOCIATION ANNUAL MEETING 1981

RESOLUTION NO. J-1

(Approved by the 11,780 participants
in the plenary business session,
January 29, 1981)

FROM: Research and Technological Development Committee
APPROVED BY: Resolutions Committee
SUBJECT: Federal Support for Fuel Cell Commercialization

Rural electric cooperatives have great interest in the development of fuel cell power plants because of significant advantages not found in conventional generating equipment. These characteristics show promise of economic benefits for the consumer, improved service availability, conservation of fuel resources, and a cleaner environment.

Commercialization of fuel cell power generation is so near, yet so far from being achieved. The phosphoric acid fuel cell has been developed to the point of large-scale demonstration at the power plant level. But the continued commercial development of the fuel cell continues to need major Federal government financial support.

The next step in establishing commercial viability involves broad exposure in the market environment. The risk of proceeding as a strictly private investment has become unacceptably high, due to the economic climate and changing and unpredictable government involvement in utility decisions.

It is both essential and proper that the Federal government assume a significant portion of the financial burden. We urge the Federal government, with support from the Congress, to support a comprehensive integrated program with all segments of the utility industry to provide a basis for commercial fuel cell power plant development for electric utility service.

SUMMARY OF STATEMENT

Mr. LEBER. I would like to briefly summarize my statement if I might. I would like to introduce the folks who have joined me here again.

I am Eric Leber. I am the Chairman of the Government Affairs Committee of the Fuel Cell Users Group of the Electric Utility Industry and Director of Energy Research for the American Public Power Association. Accompanying me are Ann Hegnauer who is the Program Manager for the Fuel Cell Users Group and Mr. Lowell Endahl who is also with the Government Affairs Subcommittee and Coordinator for Research and Development at the National Rural Electric Cooperative Association.

We have come here today for several reasons. First, the fuel cell has the potential to become a source of electrical and thermal energy that has significant environmental, economic and efficiency advantages over conventional generation equipment and conceivably it could revolutionize the energy industry the way solid-state components changed the electronics industry. Second, there remain significant technical, operational and economic questions about the fuel cell that have yet to be fully addressed in laboratory or field experiments. Third, we would prefer to buy American made fuel cells.

As you heard in previous testimony, there are several foreign firms that are very aggressively pursuing this technology. We would like to see the Americans keep abreast of these efforts. On these grounds, we—representing prospective users of fuel cells—believe that a broadly based, broadly supported program to prove out the capabilities of this energy option within the next five years would be fully consistent with our national priorities of energy self-sufficiency, economic well being, and environmental health. Accordingly, we suggest that \$30 million for the Department of Energy's phosphoric acid fuel cell program would be the appropriate Federal share in this effort in fiscal year 1982. The Department of Energy request for this item is \$10.1 million, less than half the amount this committee approved for this year.

If I might, I will very briefly summarize some of the characteristics of the technology of the Fuel Cell Users Group for the reference of the committee. The fuel cell differs from conventional generation equipment insofar as it does not boil water to produce steam. It is actually essentially the solid state electrochemical system in that it converts chemical energy of the fuel, in this case refined fuel which is used to generate hydrogen directly into electricity by a chemical process. It is about half again as efficient as conventional equipment. Its emissions are substantially less, about a factor of 10 over conventional equipment. It uses essentially no water, it is silent. It has very modest land requirements and it can be placed within a city or in an industrial complex and it allows it to be used in an integrated mode to produce thermal energy for industrial, commercial or residential heat requirements.

The efficiency in integrating the fuel cell in this fashion approaches 80 percent literally, rather dramatically improved over conventional generation equipment where efficiencies are in the range of 30 percent. Additionally, we anticipate the fuel cell will have a great deal of flexibility using gaseous and liquid fuels from conventional as well as unconventional sources.

FUEL CELL USERS GROUP

I might say a word about the Fuel Cell Users Group. The Fuel Cell Users Group of the Electric Utility Industry is a comparatively new organization, about a year old, with 43 members. As we have indicated, they are prospective users of the fuel cell who have joined together to encourage the development of fuel cells by interactions of both technology and information with the government, with the utility industry and with the prospective manufacturers of the technology.

The Fuel Cell Users Group is quite broadly based. It is comprised of utilities of all sizes, utilities that are privately owned and publicly owned. They cover the full reaches of the country from Oregon and Washington to Minnesota and the Mississippi very comprehensively.

The Fuel Cell Users Group is dedicated towards achieving a commercial technology for the energy industry in this country and of course to work towards commercialization we have to see a successful conclusion of the research and development efforts that are underway. Our initial estimates for a coherent program, a joint effort with the private and public sectors, for fiscal year 1982 were approximately \$50 million. This was a fairly broadly accepted number and enjoyed a wide range of consensus throughout the industry. However, we all recognize the need to limit our budget and our expenditures at this time. As a consequence we have re-evaluated and reassessed the needs of the program in our revised request as \$30 million.

Mr. LOEFFLER. That is \$20 million more than what it was.

Mr. LEBER. Yes. This does represent a minimum level of effort which would retain some semblance of the program plan which is currently underway at the Department of Energy. However, we anticipate that this lower level of funding, the \$30 million, will introduce about a three year delay time lag and in the limitation of the effort.

Mr. LOEFFLER. What amount of money has your group put up on its own in making an effort to expedite the goal that we all seek to achieve?

Mr. LEBER. To date, approximately \$200 million has been spent by the utility for phosphoric acid and approximately \$120 million of that, 65 percent, has come from the nongovernmental sources; that is to say, the utilities, the manufacturers and the Electric Power Research Institute which is a research institute supported by the utilities which have contributed approximately 65 percent of the total funds for the program at this time.

I did indicate that the strong degree of interest in this domestic effort is based on the fact that there are foreign companies, as we have heard before, that are very resolutely pursuing this technology and at the bottom of page 3 I did indicate some of these specific firms and their particular purposes.

The \$30 million that we are requesting instead of the \$10.1 million which is in the budget would allow some degree of continuity in the program. It would allow the technology and developing and testing to continue and it would provide sufficient resources to pursue competitive options and alternative applications of the fuel center.

The interest in the technology remains very high. My organization, the American Public Power Association, and the Natural World Electric Association which is also represented here have been working independently with engineering firms to identify options for the fuel cell technology. There is a sustained amount of interest and support for the technology in view of its economic efficiency and environmental characteristics. We believe that it would be of interest to the American people to continue this program. We have played, as I say, a very significant role in its development. We do, however, feel that it would be in the Nation's interest to generate public and private interest and that is why we have come here today to submit our statement.

I welcome any questions you might have.

Mr. LOEFFLER. Thank you, Mr. Leber. I have no further questions.

If either of you would like to address any remarks, feel free to do so.

Mr. ENDAHL. I think Mr. Leber has very eloquently expressed our views as far as the rural electric program is concerned. Our membership passed a resolution at its annual meeting that was attended by some nearly 12,000 people just the end of January and reaffirmed its support. We see it in a little different point of view than the other utilities, we are interested in the disbursement of it where it has an exceptional load characteristic and therefore we see it as potential for possibly displacing this.

Mr. LOEFFLER. I might also say that the time has certainly escaped the proposed agenda for this morning. Again to the best of your capabilities as witnesses, please try to observe the ten minute rule. We will be lenient and give you the opportunity to make your presentation. We have six more witnesses, including the present witness listed for this morning. After this testimony has been given we will consider three or four more witnesses before lunch and then reconvene at 1:30 p.m. I will converse with counsel and we will make an announcement after this testimony.

INSTITUTE OF GAS TECHNOLOGY

DOE—FOSSIL ENERGY

WITNESS

BERNARD S. LEE, PRESIDENT, INSTITUTE OF GAS TECHNOLOGY

Mr. LEE. Good morning, Mr. Chairman.

Mr. LOEFFLER. Without objection, your prepared remarks will be inserted in the record at this point and you may proceed.

[Material follows:]

Statement by Dr. Bernard S. Lee, President
 Institute of Gas Technology
 Before the House Committee on Appropriations
 Subcommittee on the Interior
 Hearings on Department of Energy Budget Appropriations

February 19, 1981

Mr. Chairman and members of the subcommittee:

My name is Bernard S. Lee. I am president of the Institute of Gas Technology, a not-for-profit, energy R&D organization affiliated with the Illinois Institute of Technology in Chicago. IGT has specialized in conducting energy RD&D work and energy-related education programs for 40 years. I will provide you today with our assessment of some important energy issues, together with information on several specific technologies for utilizing our fossil energy resources efficiently and in an environmentally clean manner. These technologies can have a major impact on the development of our domestic energy supplies and the strengthening of our national security.

My testimony is directed to the Department of Energy's FY82 budget appropriations. We are concerned with the short-sighted proposed budget cuts, particularly those in the fossil energy area.

I will specifically discuss the Memphis Industrial Fuel Gas Demonstration Plant, pilot plant testing for peat gasification, and the HYGAS® Phase Zero design activities. Before detailed discussion of these projects, I would like to comment on the continued need for synthetic fuels development for our nation's energy security and economic future.

We need to preserve continuity in energy R&D to foster better, more efficient and more appropriate ways to meet our energy needs. Our nation has been trapped in the past when we failed to address a problem before it was upon us. A good example is Pearl Harbor, which caught us unprepared, practically defenseless, and propelled us into a synthetic rubber industry and gasoline rationing. Now, a Mid-East war seriously threatens the energy supply of the free world at a time when the U. S. is painfully import-dependent. We have the resources and technology to reduce the threat to manageable proportions, but the utilization of these resources will be severely hindered by failure to recognize the importance of the long-term impact of such resource development on the nation. We remain gravely vulnerable.

A critical issue is the lead time for getting major new energy supply sources in place. No matter how hard we push, it would be seven or eight years before synthetic fuels could provide meaningful increments of energy supply. We must accept at least another decade of energy dependence with the associated economic deprivation and threat to our national security. Our vulnerability beyond that point will equal precisely the extent to which we delay now.

In recent months, some energy analysts have expressed concern that the time frame for deployment and use of synthetic fuels will not extend much further than the year 2000, and that we should focus our major efforts on development of solar energy, renewable resources, and other non-fossil fuel technologies. This position overlooks and ignores some very concrete realities. First, we cannot assume that new technologies to provide needed increments of energy supply will be available and deployed at the time needed. On the other hand, our reserves of coal, oil shale and peat are very large, are known with a relatively high degree of certainty, and the technology to effectively utilize these resources is either available now or in the near future if we continue current RD&D programs. The inability or refusal to think beyond the year 2000 seems to be a rather peculiar American phenomenon. Western Europe has no such problem. Their energy planning extends well into the twenty-first century, and both coal conversion and large imports of American coal are part of their future energy scenarios.

An often-used excuse to defer synthetic fuels development and particularly SNG technology is the existence of the so-called "gas bubble" — that amount of natural gas available in excess of immediate needs. The only reason there is an apparent surplus is because the regulatory structure restricts gas sales. Even if this artificial and momentary surplus were used to offset oil imports in many applications where oil and gas are directly substitutable, we would still need to import an unacceptably large quantity of oil.

A second blind spot in reasoning is the misperceived cost of oil imports. The argument is often made that synthetic fuels development should be deferred until they are fully competitive with imported oil. This is also a fallacious position. Our analyses indicate that the real cost of imported oil is at least three times higher than the direct cost in terms of inflation, trade balance, loss of jobs and national security. Full recognition of these costs should be a major factor in assessing the future role of government support of synthetic fuels RD&D.

The initial commercial synthetic fuel plants will necessarily be based on commercial processes which were developed some years ago, largely in foreign countries. These technologies are eligible for SFC funding. However, there are many new technologies in various stages of development which offer higher efficiency, lower costs and which will tap unused resources. Before they can be commercialized, they must be carried through the laboratory, pilot plant and demonstration phases. If R&D continuity is not sustained, we will lose time, disperse the teams of scientists and engineers who are creating the new technologies, and inevitably lose much hard-gained knowledge. We must try technologies on a sufficiently large scale to determine their technical, economic and environmental feasibility. Many promising approaches have been placed in limbo because funding was cut off before they were tested at an appropriate scale. Continued DOE funding would be appropriate for these technologies.

A major reason to continue and even accelerate R&D on synthetic fuels is that the bulk of our resources are in solid form — coal, oil shale, peat and biomass. However, much of our in-place energy transmission, distribution and utilization system, representing an investment of hundreds of billions of dollars, was designed to handle liquid and gaseous fuels. We can expect new systems, such as coal slurry pipelines, to meet part of future energy needs, but it just makes good economic sense to provide liquid and gaseous synthetic fuels so the present systems can be utilized fully in the future.

Today I would like to emphasize the need for continued government support of the demonstration plant phase of energy development programs. A demonstration plant is a unit large enough to demonstrate the commercial, economic and environmental feasibility of a process. This demonstration stage carries a sufficient degree of risk so that commercial financing is not possible. A good example is the Memphis Industrial Synfuels plant, based on the U-GAS® process developed by IGT. This plant uses American technology and indigenous coal to produce a gas suitable for industrial use. There is an existing contract between Memphis Light, Gas and Water Division and the federal government which provides cost sharing by MLGW and a financing plan for the eventual buy-back of the plant from the federal government by MLGW. We understand that Mr. David Hansen, President of MLGW, will discuss this project with you in some detail during the course of this hearing. We fully support Mr. Hansen's position.

PEATGAS

Another major program which we have underway is the pilot plant testing of the gasification of peat. This committee has consistently supported our work in this area for a number of years and provided the funding for the resource evaluation and the preliminary technology development for the gasification of peat. Peat is a resource which is very economically attractive because it is located in states not endowed with other indigenous energy sources. While countries like the Soviet Union and Finland are actively involved with their use of peat for energy purposes, the United States, which possesses at least 1400 quads of peat energy equivalent, is dismally deficient in this regard. The Michigan and Minnesota congressional delegations, as well as ten others, consider it essential that DOE's peat program receive continued support and full funding, since they import almost all of their energy. The pilot plant program at IGT for gasification of peat utilizes an existing facility, which is currently under modification. The use of this equipment has resulted in savings to the government since a new pilot plant was not required. The modification of the existing facilities is more than half complete at this point. If this project is dropped at this stage, it would be very difficult for private industry to develop the necessary technology for commercialization of this abundant resource. I consider stopping the development of this promising technology at this stage a false economy. The recent deregulation of oil and the possible deregulation of natural gas will result in price increases making PEATGAS™ more economic than before. If the modifications of the pilot plant are completed, as planned, the plant will be running in FY81. We strongly urge continuation of the funding of the peat gasification program at least through the pilot testing stage.

HYGAS

I would also like to call to the committee's attention the situation with respect to the HYGAS process developed through the pilot plant stage by IGT. This is the only new American-developed technology which can utilize Eastern coal to produce high-Btu pipeline quality gas, and is ready for a Phase Zero site-specific preliminary design. This will complete the R&D activity for this technology. Five million dollars for a Phase Zero study were approved by this committee for FY81, but a rescission of these funds was requested by the Carter Administration. It is our hope that the FY81 funding will remain available for obligation during this year. These funds will be adequate for the Phase Zero study.

HYTORT

We appreciate this Committee's past support of our development of the HYTORTTM process to utilize our large reserves of eastern oil shale. I am pleased to report that this technology is now being further developed under private sponsorship.

FUEL CELLS

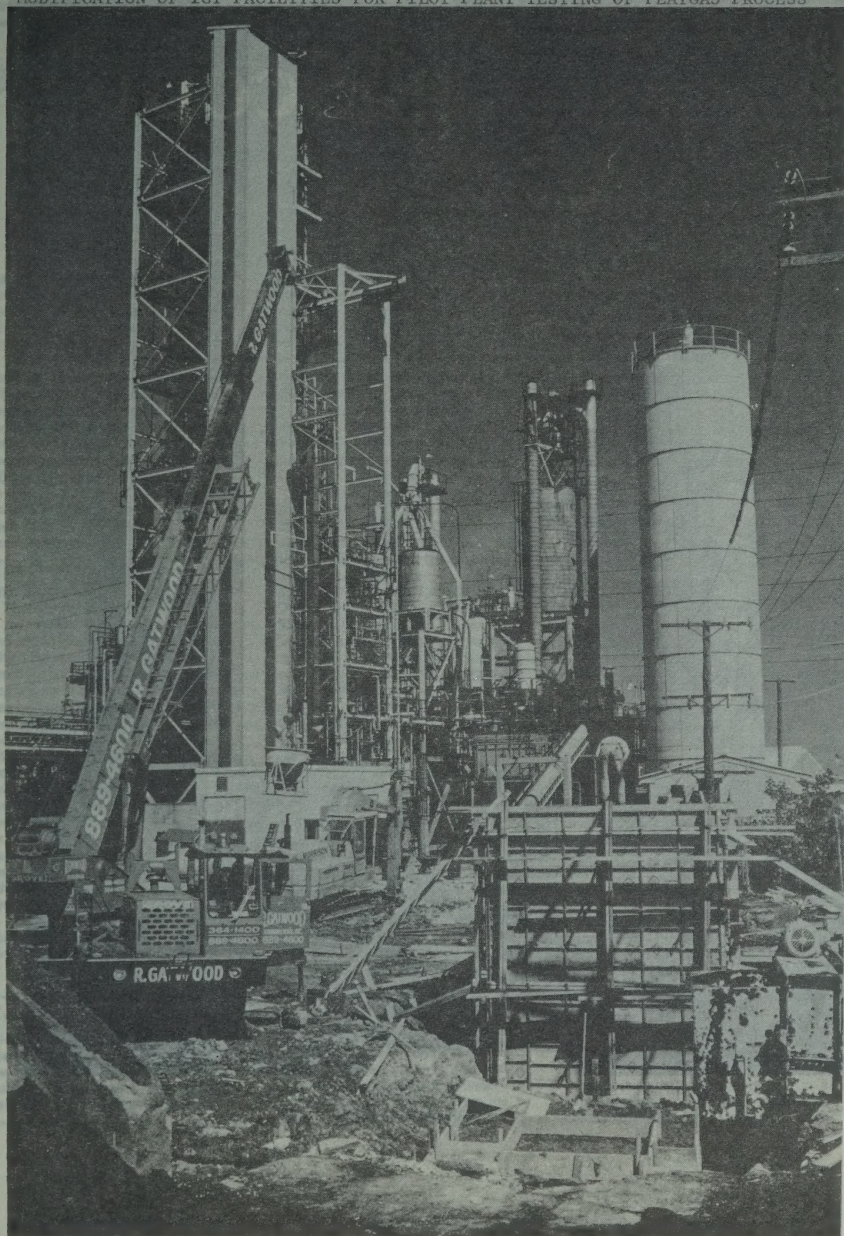
IGT continues to direct its efforts in the development of second-generation fuel cell technology toward applications both for co-generation, and for integrated coal gasifier-fuel cell power plants. This system for generating power is much more efficient than conventional coal-fired power plants. IGT, with its long history of molten carbonate fuel cell research dating from 1959, and with its work in coal gasification and gas clean-up systems, is uniquely positioned to optimize the conversion of coal to electric power. We request that the committee continue to support full funding of the molten carbonate fuel cell program as contracted by the Department of Energy.

SOLAR THERMAL ENERGY

As we reported to you last year, we have been continuing our work in the use of solar thermal energy to produce fuels and chemicals, such as hydrogen, alcohols and ammonia. Although these chemicals are produced from hydrocarbon sources today, long-range R&D is needed to utilize solar energy as a substitute for fossil fuels. We commend this important area of renewable energy supply for the committee's continued strong support.

Thank you for giving me the opportunity to express my concern for the need to continue the aggressive development of indigenous energy resources, so vital to our nation's security. The assurance of adequate energy supply is of such paramount importance that any action that inhibits such development is clearly contrary to the national interest. I urge this committee to continue its commitment to the prompt development of a broad spectrum of alternative energy supplies.

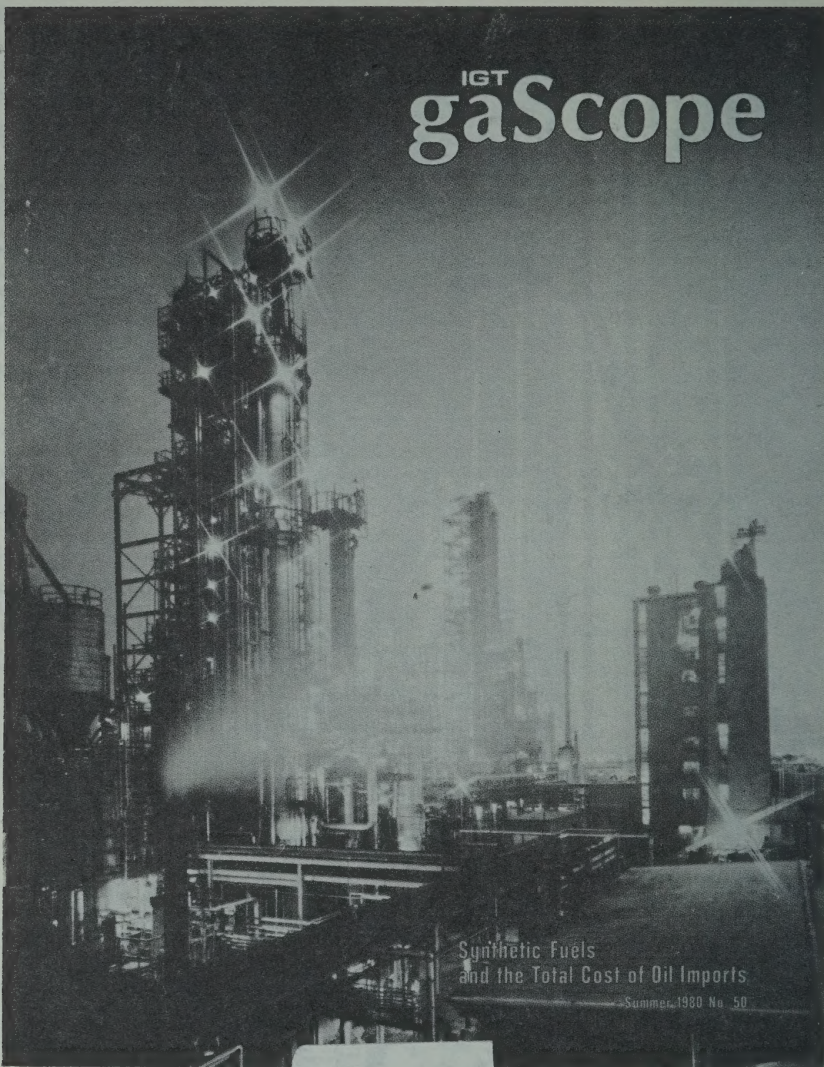
MODIFICATION OF ICT FACILITIES FOR PILOT PLANT TESTING OF PEATGAS PROCESS



IGT gaScope

Synthetic Fuels
and the Total Cost of Oil Imports

Summer 1980 No. 50



Synthetic Fuels and the Total Cost of Oil Imports

by Bernard S. Lee, President
Institute of Gas Technology

This paper was presented at the Seventh Annual International Conference on Coal Gasification, Liquefaction, and Conversion to Electricity at the University of Pittsburgh, August 7, 1980.

Today, I would like to examine some basic policy and economic issues which will influence the development and deployment of a synthetic fuels industry. The three areas which I have selected for analysis are (1) the overall technological basis of synthetic fuels, (2) the cost of synthetic fuels relative to imported oil, and (3) the deployment schedule necessary for a synthetic fuels industry to meet projected production goals.

The Technological Basis for Synthetic Fuels

The technology of synthetic fuels is, in my opinion, the most manageable and least troublesome of the factors which influence development of a synthetic fuels industry. Although sometimes it seems that our progress has been agonizingly slow, a look back ten or fifteen years from the present indicates a healthy growth pattern. Other countries provide good examples of what can be accomplished given the dedication to meet national goals and the will to proceed despite formidable obstacles. I cite as examples the development of Canadian tar sands, the expansion of synthetic fuels production capability in South Africa, and the alcohol production program in Brazil.

The lag in the United States is not due to lack of effort on the part of individual companies or to lack of

technology. The gas utility industry, in particular, has been trying since 1972 to build coal-gasification plants using commercially available Lurgi technology. To date, although a dozen or more projects have been proposed, none have been implemented. Several advanced processes are ready for demonstration. Again, construction has been delayed. The same scenario is evident in the efforts to get started on liquid fuels from coal and oil shale and combined-cycle electric power generation based on coal gasification.

Fortunately, this logjam started breaking up in the last year. The Great Plains high-Btu coal gasification plant, based on Lurgi technology, may get started this year even though the legal issues impeding the proposed funding method are not resolved. The Department of Energy and the Memphis Gas Light and Water Division are jointly funding a large medium-Btu demonstration plant based on IGT's U-GAS™ process to provide the utility with industrial fuel gas, with completion scheduled for 1984. Construction of one or more high-Btu gas demonstration plants may be initiated in 1981. The SRC-I and -II programs are well under way. The electric power industry is proceeding with a large demonstration program on combined-cycle power generation based on the Texaco gasifier. The development of western oil shale is being accelerated. Exxon Corporation has purchased a controlling interest in the Colony oil shale project with the goal of putting a 46,000-bbl-per-day plant on stream in 1985 using the Tosco process. Union Oil Company has announced its intention to invest \$130 million in a 9,000-bbl-per-day pilot plant in Colorado.

The Synthetic Fuels Corporation has been established to aid in the commercial application of existing and advanced technologies. A wide variety of advanced technologies is under investigation, as is evident from the many excellent papers presented at

this meeting. All these developments show we are making some real progress.

The Cost of Synthetic Fuels Relative to Imported Oil

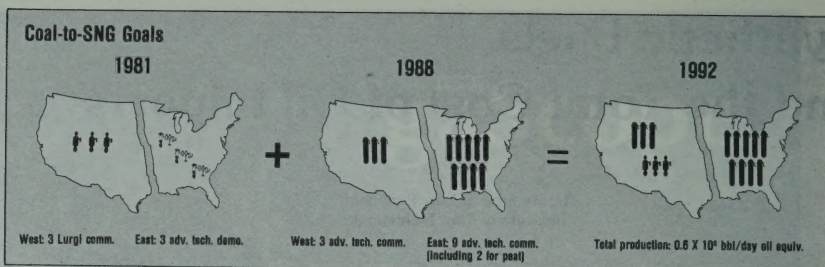
A major issue which has impeded development of a synthetic fuels industry is the argument that they cannot compete with conventional fuels on a price basis. This may have been true in the past, but even then the reasoning was suspect because the comparison was often made using conventional fuel prices which, by regulation, were held at a level below their true market value. The recent sharp increases in world oil price, combined with the phased deregulation of U.S. conventional crude oil and natural gas, have made synthetic fuels much more attractive from an economic viewpoint.

However, there is a more basic economic problem which must be recognized in comparing natural and synthetic fuels. There is practically unanimous agreement that overdependence on imported oil is the cause of many of our current problems. The price of this imported oil is high—about \$35-\$37 per barrel at present—and rising steadily. The problems arise from the fact that the posted price of imported oil does not truly reflect the actual cost to the United States. By actual cost, I mean not only the posted price but the effect of imported oil on inflation, employment and national security.

A little over a year ago, we at IGT started considering these additional costs of imported oil (1). At the time there were only two or three very generalized estimates available on the external costs of a barrel of imported oil, ranging from \$10 to \$100 per barrel (2, 3, 4). We decided to try to quantify these costs by attempting a more explicit estimate of the major external costs associated with oil imports.

Cover

Energy conversion processes developed by IGT at its facilities in Chicago are the subjects of DOE feasibility studies directed toward the deployment of a national synfuels industry.



Before proceeding, let me define the meaning and role of externalities. When a cost or benefit is incurred by someone other than the producer or buyer, it occurs outside the market transaction and is thus an externality. An external cost occurs when part of the cost of producing or using a good must be paid by someone other than the firm which produced it or the individual who consumed it. Prices, thus, do not always reflect all the costs incurred in producing or even using a product. For example, manufacturers poured smoke relatively freely into the air when they did not have to pay the cost of environmental cleanup. Externalities create the case for government intervention to either set standards to end the externalities or to set payments on the market transaction such that those who incur external costs are compensated or those who receive external benefits contribute in a market transaction.

The consumer of imported oil is largely spared the external costs, and the external costs are not felt by the consumer when he makes his market transaction. Thus, the cost of imported oil is lower than if the cost reflected the associated externalities of inflation, unemployment, and national risks. This causes a biased cost comparison leading the consumer to overconsume oil imports.

Table 1 shows the latest results of our continuing work in this area. The components of the externalities associated with reducing oil imports are combined and joined with the direct benefit of lower oil imports. The study is based on a reduction of oil imports into the United States by 500,000 barrels per day, and the benefits per barrel would be essentially unchanged for reductions in oil imports much higher than the base case.

The direct benefit is, of course, the base price of imported oil, which is assumed to increase at 2% per year in real terms. The United States would

have an improved trade balance with consequent currency appreciation and lower inflation if oil imports were lowered. As demand on the world market slackens due to reduced demand by the U.S., lower oil prices will result. Additionally, there will be added real output in the economy due to the decreased dollar leakage to foreign countries to pay for the imported oil.

The final external benefit—improved national security—is the most difficult to estimate. In our study, we assumed that this benefit can be conservatively approximated by the value of the lost economic costs of about \$64 per barrel, due to the reduction in gross national product caused by an embargo, and then further reduced to \$6.71 per barrel by taking into account the existence of a billion barrel strategic petroleum reserve, increased

conservation and draw-down of private inventories in the event of an embargo. Another approach, equally difficult to quantify, is to consider the cost per barrel of imported oil of that portion of the national defense budget which must be allocated to protection of our foreign sources of supply. For example, if in the future it is necessary to increase the national defense budget by 10% over the current budget of \$139 billion in order to protect our foreign sources of supply, the cost again would be about \$6 per barrel. In any event, we believe that this external benefit, along with the other externalities estimated, tends to be on the conservative side.

If the external benefits of reducing oil imports are added to the direct benefit, then the total per barrel benefit of large scale reductions in oil imports will be on the order of \$75 to \$110 per

TABLE 1. Benefits from Reduction of Oil Imports by 500,000 Bbls/Day (1980 \$/bbl)

	Year 1	Year 3	Longer Term
Direct benefit	\$37.00	\$38.49	\$40.00
External benefits			
Oil price effect	12.41	19.07	12.41
Inflation effect	9.92	23.04	11.90
Employment effect	7.32	22.92	8.78
Security effect	6.71	6.71	6.71
Subtotal	36.36	71.74	39.80
Total benefit	\$73.36	\$110.23	\$79.80

TABLE 2. Hierarchy of Supplemental Energy Sources by Cost

Supplemental Sources	Estimated Price at Point of Production \$(1979)/10 ⁶ Btu
High-Btu gas from coal (2nd generation)	4.00-5.50
Medium-Btu gas from coal (1st generation)	4.00-5.50
Solvent-refined coal (solid)	4.00-5.50
Crude shale oil (all processes)	4.00-6.00
High-Btu gas from coal (1st generation)	5.00-6.00
Low-sulfur heavy fuel oil from coal	5.00-6.00
Distillate fuel oil from coal	6.00-7.00
Methanol from coal	6.00-9.00
Gasoline from coal	8.00-11.00

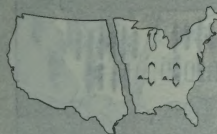
Source: Gas Research Institute

Coal-to-Fuel Gas Goals

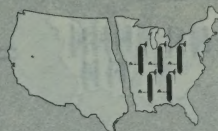
1981

1988

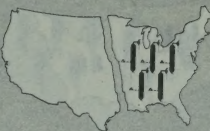
1992



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West: none East: 2 demo. plants

West: none East: 5 adv. tech. comm.

Total production: 0.1×10^6 bbl/day oil equiv.

barrel over a three-year period and, over a longer term, about \$80 per barrel, or \$13.80 per million Btu. In comparison, recent estimates of the costs of synthetic fuels from coal and oil shale are in the range of \$23 to \$64 per barrel of oil equivalent, or \$4.00 to \$11.00 per million Btu (1979 dollars). (Table 2.) On this basis, synthetic fuels are a bargain compared with imported oil.

After considering the external costs of oil imports, the obvious next question concerns the size of the externalities associated with synthetic fuels production. In the last decade, the United States passed a series of environmental protection laws, with the result that some of the external costs are now part of the firm's production costs and as such are reflected in the market price or the direct cost. For example, the price of coal from strip mines now includes a charge to cover land reclamation costs. Land reclamation has been made part of the firm's cost by public policy; the externalities, in the language of the economist, have been internalized. For many new technologies, the externalities associated with air, water or land pollution have been made part of the production costs. Thus, the United States has seen the direct costs of these sources rise rapidly, while the external costs have largely disappeared.

Some external costs still may exist, however, with respect to coal, water, capital, environmental and health areas. These remaining externalities of synthetic fuels are the subject of ongoing studies at IGT. Preliminary results indicate that even if the remaining foreseeable externalities are added to the cost of SNG from coal, the total cost will still be about \$30 per barrel of oil equivalent lower than imported oil with its external costs. Thus, using these economic measures, synthetic fuels will still be a bargain compared to imported oil.

Deployment of a Synthetic Fuels Industry

The third major area requiring consideration is the deployment of a synthetic fuels industry. In July of 1979, President Carter proposed a goal of displacing 2.5 million barrels per day of oil imports by synthetic fuels and unconventional gas production and an overall reduction of 4.5 million barrels per day from these sources plus heavy oil and various conservation measures. The program is ambitious, but, in my opinion, achievable if the nation approaches this program with a total commitment and mobilization of its human, technical and financial resources. The two mainstays of a realistic energy policy are expanded energy supply and increased energy conservation. The nation needs both. Those who claim that conservation alone can solve the energy problem for the long term mislead the public and do themselves and the nation irreparable disservice.

It is imperative to begin immediately the energy supply options, especially synthetic fuels, because it takes long lead-times plus large capital to develop these options. Several years gained by concerted action now can more than pay the cost of development, given the true cost of imported oil and recognition of the fact that it will cost even more in the future.

Although the President's program deals with large-scale commercial deployment of various technologies to achieve a substantial oil import reduction, it is also imperative that well-planned programs for research, development and demonstration be continued to maintain the flow of technological innovations and improvements. The President's program establishes the mechanism for launching the synthetic fuels industry on a broad front. This vital step in no way diminishes, and in fact demands

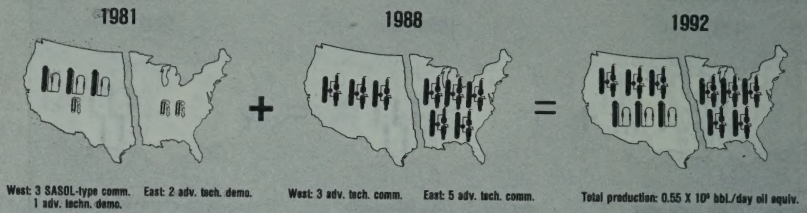
greater emphasis on, the need for solid research and development to support the massive commercialization effort.

The supply segment of the President's program contains two major elements which I wish to address. These are (1) the development of 2.5 million barrels per day (MMB/D) of oil substitutes with liquids and gases from coal, peat, oil shale, biomass, and unconventional gas; and (2) the requirement to cut utility consumption of oil by 0.75 million barrels per day.

When the President's program was announced last year, I outlined a schedule that would achieve these targets (5). Since that time, the Synthetic Fuels Corporation has been formed, with the preliminary goal of 500,000 barrels per day oil equivalent of synthetic fuels production by 1987 and 2 million barrels per day by 1992. Although this production schedule is about two years later than the President's original plan, the total quantity of synthetic fuels is about the same. Since the present SFC production targets have not been defined individually, I believe my earlier analysis is still applicable, with all the dates pushed back two years.

My program would achieve the target goals through two waves of deployment. The first wave consists of deploying several commercial plants using currently-available technologies, while simultaneously deploying demonstration plants for a number of advanced technologies to establish their commercial viability. The second wave will then come in the late 1980's for deploying commercial plants based on demonstrated advanced technologies. Those first-wave commercial plants will continue to be feasible because of the cost escalation during the time period while advanced technologies are being demonstrated. These plants will also provide a real reference for production cost, performance and environmental data.

Coal-to-Liquids Goals



The second-wave commercial plants will be more efficient and economical than the first wave and will be the basis for the competitive growth of the synthetic fuels industry.

In my program, I have indicated the number of demonstration and commercial-size plants needed as well as when and where these should be deployed. The number of plants represents the number of commercial-size units. Some locations may support more than one unit. Similarly, a demonstration plant can be expanded to a commercial-size plant at the same site. Specifically:

- As to the split between gaseous and liquid fuels, since (1) gaseous fuels can be substituted directly for oil in essentially all stationary applications, (2) gas represents a finished product of high form value, and (3) the cost of gas production is lower than that of liquids, IGT recommends that at least half of the target goal be synthetic gases.
- IGT recommends that the fossil resources in the East be strongly emphasized because:
 - a. the recoverable bituminous coal resource in the East is at least as great as that of lignite or subbituminous coal in the West, and similarly for Eastern shale relative to Western shale;
 - b. water is much more available in the East;
 - c. markets are much closer to the points of production in the East;
 - d. the skilled manpower pool and manufacturing resources are greater in the East.
- To fully utilize coal, both high- and medium-Btu gasification plants should be on-stream. Medium-Btu gas plants can economically serve industrial users concentrated within

TABLE 3. Implementation of Two Elements of President Carter's Program

A) Target: 2.5 MMB/D oil substitutes with gases and liquids from coal, peat, oil shale, biomass and unconventional gas by 1992

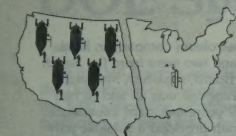
	Oil Equivalent, MMB/D
1) Coal Gases and Liquids	1.25
o 15 high-Btu gas commercial-size plants, 6 in West, 9 in East, each 250 X 10 ⁶ Btu/D	
Total 0.6 MMB/D	
i) Deploy now 3 Lurgi commercial plants in West	
ii) Deploy now 3 demo plants in East for advanced technologies	
iii) Deploy in 1988 using advanced technologies:	
3 commercial plants in West	
9 commercial plants in East (including 2 using peat)	
o 5 medium-Btu industrial fuel commercial plants, each 100 X 10 ⁶ Btu/D	
Total 0.1 MMB/D	
i) Deploy now 2 demo plants in East	
ii) Deploy in 1987, 5 commercial plants in East	
o 11 coal liquids plants, each 50,000 B/D	
Total 0.55 MMB/D	
i) Deploy now 3 SASOL-type plants in West	
ii) Deploy now 3 demo plants for advanced technologies, 2 in East, 1 in West	
iii) Deploy in 1988 using advanced technologies:	
3 commercial plants in West	
5 commercial plants in East	
2) Oil Shale	0.4
o 7 shale liquids commercial plants, 5 in West, 2 in East; 1 Eastern shale, high-Btu gas commercial plant	
i) Deploy now 5 Western shale liquids commercial plants, each 50,000 B/D	
Total 0.25 MMB/D	
ii) Deploy now 1 Eastern shale demo plant	
iii) Deploy in 1988, 2 Eastern shale liquids commercial plants, each 50,000 B/D, and 1 Eastern shale, high-Btu gas commercial plant, 250 X 10 ⁶ Btu/D	
Total 0.15 MMB/D	
3) Biomass	0.1
4) Unconventional Gas	0.75
Production Capacity Total 1992	2.5
B) Target: 0.75 MMB/D oil reduction in utility boilers by 1992	
1) Coal Gasification in Combined Cycle	0.4
o 20 commercial plants, each 100 X 10 ⁶ Btu/D or 500 MW	
i) Deploy now 3 demo plants in East	
ii) Deploy in 1988, 20 commercial plants, mostly in East	
2) Other Oil Displacements, e.g., Fluidized Coal Combustion, Direct Coal Combustion with Stack Gas Cleanup	0.35
Reduction Total	0.75

Oil Shale Conversion Goals

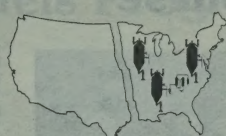
1981

1988

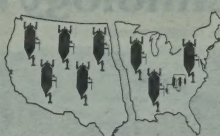
1992



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West: 5 Eocene shale-to-liquids comm. East: 1 Devonian shale-to-gas/liquids demo.

West: no additions East: 2 shale-to-liquids comm. 1 shale-to-gas comm.

Total production: 0.4×10^6 bbl/day oil equiv.

a relatively small radius, while high-Btu gas plants can be connected to the existing natural gas transmission and distribution network to serve residential, commercial and industrial users.

- In the area of oil shale, the President's target can be achieved by simultaneously developing shale resources both in the West and in the East to produce both high-Btu gas and liquids. The Eastern shale resources, in addition to being close to the population centers with much greater water availability, have a more favorable shale chemical composition that minimizes leaching and should be developed via advanced hydrogen retorting technologies.
- The President's targets for biomass and unconventional gas appear reasonable.
- To achieve a 50 per cent reduction of oil use in utility boilers, a logical approach is to replace oil with clean fuel gas from Eastern coal, since many of these boilers are concentrated in the East. At least half of the President's target should be met by making use of advanced gasification and combined-cycle technology that not only provides

clean fuel but also more efficient power generation.

The detailed deployment schedule of the various synfuels resources is outlined in Table 3. According to this plan, by the late 1980's, after the first-wave deployment, we could have a synthetic fuels production capacity of 520,000 barrels per day of oil equivalent, very close to the current target of 500,000 barrels by 1987. The total after the second-wave deployment would be 2,050,000 barrels per day of oil equivalent of synthetic fuels, again very close to the current target of 2,000,000 barrels per day by 1992.

Of the total after the second wave, as indicated in Table 4, synthetic gases, both high- and medium-Btu, to provide oil substitutes and to reduce the use of oil in utility boilers would amount to 1.15 MMB/D oil equivalent. The total synthetic liquids from coal and oil shale would amount to 0.9 MMB/D oil equivalent. The capital investment, in 1979 dollars, excluding mining investment, would be about \$90 billion for synthetic fuels production. This figure is very close to the planned funding of the Synthetic Fuels Corporation.

A massive commitment of financial and human resources will be necessary to carry out this ambitious program.

Since time is short, action must start immediately to resolve the regulatory and institutional constraints. A rational and workable balance between environmental and energy goals must be established and maintained. The adversary stance of government and private industry must be reversed to one of mutual cooperation. If we can accomplish these objectives and start developing a synthetic fuels industry, the benefits will increase commensurately with the commitment. The security of energy supply will increase, our national defense posture will be strengthened, the price rise of imported energy will be moderated, and the U.S. can formulate and implement national and international policy free of the constraints imposed by overdependence on foreign energy supplies.

In summary, we have a large and rapidly expanding technological base for synthetic fuels production. The true cost of synthetic fuels to the nation is lower than the cost of imported oil. Given a workable government-industry relationship, a substantial synthetic fuels industry can be deployed: Let's get on with the job.

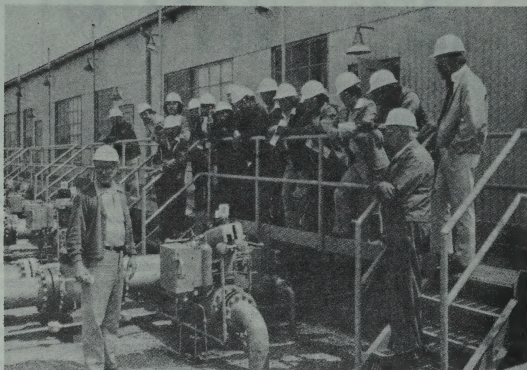
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TABLE 4. Synfuels Plant Deployment after Second Wave in 1992

	Eastern States	Western States	Energy Output	
			10^6 Btu/Day	10^6 MMB/Day
Coal to SNG	7	6	3250	0.5
Peat to SNG	2	—	500	0.1
Coal to fuel gas	5	—	500	0.1
Oil Shale to SNG	1	—	250	0.05
Oil shale to oil	2	5	—	0.35
Coal to liquids	5	6	—	0.55
Coal to combined cycle (barrels of oil displaced)	14	6	2000	0.4
Other power plant displacements				0.35
Biomass				0.1
Unconventional gas				0.75
		Total		3.25

Malaysians Complete Gas Technology Course



On one of their field trips, the Malaysians inspected a compressor station of the Natural Gas Pipeline Company near Joliet, Illinois.

IGT awarded diplomas June 20 to 16 graduate engineers from Malaysia after their completion of a 10-month intensive course in gas technology.

The Malaysians were the second group of foreign students to complete such a course. In 1978-79, 10 Venezuelans took a similar course. Both groups participated under contracts with the Gas Developments Corporation, a subsidiary of IGT.

Current world conditions have created the need for this type of program, which IGT is uniquely qualified to provide. Until recently, many countries producing petroleum for export have flared the natural gas often produced along with the crude oil. The energy shortage that has developed in many industrial countries has created strong incentives to exploit these wasted resources. To control and manage this activity, a cadre of people with a sound background in modern gas technology is required. The IGT program is designed to provide this background.

The program is intended for engineers who are to assume

responsibility for staff engineering or field operations related to natural gas processing, transmission, distribution or utilization. Staff engineering functions include preparation of bid specifications, evaluation of proposals and investigation of field problems. Field operations include management of facilities, troubleshooting, and specification and evaluation of proposed changes in facilities. For those with recent degrees, the program provides practical gas industry training.

To be enrolled in the program, students must have a degree in engineering or equivalent background and have a good facility for written and oral English. This presented no problem to the Malaysians, who learn English in their secondary schools. Most of them also earned their engineering degrees at English and Australian universities. The Venezuelans, on the other hand, did not have this background in English. They attended an intensive five-month English course for foreign students at Southern Illinois University.

Fourteen of the Malaysian engineers were from Petronas, the Malaysian

national petroleum company in Kuala Lumpur, and two were from the Sabah Electrical Board in eastern Malaysia. Their average age was 25 and all had less than 2 years industrial experience. The program provided a valuable part of their transition from academic studies to industrial applications.

The program is arranged in a set of topic modules, each lasting from 4 to 7 weeks. Classes meet five days per week. Classroom sessions are 3 to 7 hours with assigned homework problems. Some topics include laboratory work.

The program is not theoretically oriented—such programs are available in graduate schools. It emphasizes fundamentals and practical information needed to evaluate proposals or to design and operate gas facilities. Field trips are also made to appropriate industrial installations. The program consists of the following modules:

- I. **Engineering and Economics Fundamentals** (fluid flow, heat transfer, vapor-liquid equilibrium, engineering economics, cost estimating)
- II. **Rotating Equipment** (pumps, compressors, engines and turbines)
- III. **Gas Processing** (acid-gas removal, dehydration, refrigeration, LPG recovery and processing)
- IV. **Metering, Instrumentation and Controls** (meters, regulators, valves, control systems, computing devices, etc.)
- V. **Computer Applications** (basic programming, orifice meter design evaluation, compressor simulation)
- VI. **LNG Processing** (refrigeration systems, hydraulics, LNG storage)
- VII. **Gas Pipelines** (design, construction, operation, maintenance, corrosion prevention)
- VIII. **Reservoir Engineering** (estimation of reserves, enhanced recovery, performance analysis, flow characteristics)
- IX. **Gas Distribution** (materials, design of pipe networks, construction, operation, maintenance)
- X. **Industrial Gas Utilization** (combustion fundamentals, in-

(Continued on page 8)

Three IGT Processes in DOE Synfuels Program

Of the 110 contract awards made by the Department of Energy July 10 in the \$200 million first installment of its synthetic fuels program to reduce oil imports, three involved processes developed by IGT.

The three processes are the HYTORT™ process for the production of oil from oil shale, the PEATGAS™ process for the conversion of peat to high-Btu substitute natural gas, and the HYFLEX™ process, which would be used to produce liquid fuels from Hawaiian biomass. The processes are the subjects of feasibility studies to assess their commercial potential. DOE is providing funding of almost \$4 million for the HYTORT and PEATGAS studies and about \$331,000 for the HYFLEX study. IGT is participating in all three as a subcontractor.

HYTORT

Transco Energy Company is the prime contractor to determine the feasibility of building a 2,000-barrel-per-day (BPD) or larger plant as the first module of a commercial 50,000-BPD plant for the conversion of eastern Devonian oil shale. Gas Developments Corporation, a subsidiary of IGT, is subcontractor to Transco, and IGT is subcontractor to GDC. The HYTORT process produces a light, sweet synthetic crude oil that should command a premium price in the crude oil market.

Among its other responsibilities, IGT will conduct tests of 50-ton shale samples in its process development unit and provide engineering data to support a preliminary plant design.

PEATGAS

Minnesota Gas Company is prime contractor of a study to assess the overall viability of a project to design, construct and operate a commercial facility for the production of high-Btu SNG from peat.

A generic plant design, previously prepared by IGT for Minnegasco and derived from IGT's PEATGAS process, will form the basis for the engineering design to be prepared for the feasibility study.

IGT will provide technical assistance in many areas of the feasibility study. Included will be confirmatory tests of

the selected peat, engineering reviews of the selected site and process design and overview in the areas of peat harvesting and dewatering and environmental, economic, financial risk and market analysis.

HYFLEX

In a study awarded to Pacific Resources, Inc., as prime contractor, the commercial viability of IGT's

HYFLEX process will be evaluated. The process uses hydropyrolysis to make valuable liquid and gaseous fuels without forming heavy, hard-to-handle tars.

Coal-conversion tests in a process development unit have been successful with coal, and recent work has established its applicability to biomass. Potential Hawaiian biomass resources are tree farms of eucalyptus and giant koa haole, sugar cane waste, and pineapple waste. Municipal waste and algae production are also promising. If the process proves to be commercially feasible in Hawaii, transferring it to other parts of the United States that have sufficient biomass resources should be feasible.

(Continued from page 7)

dustrial burner systems, interchangeability of gases)

The last two modules are optional. They can be inserted into the program to change the emphasis from production, processing and transmission to distribution and utilization of gas. The program can be further tailored to suit the needs of the students.

One week was devoted to field trips to several industrial facilities: a modern processing plant that produces pipeline quality synthetic gas from naphtha feed stock; a large aquifer reservoir used to store natural gas; a peakshaving plant that liquefies natural gas for use during the winter heating season; and a manufacturing plant where a training

session was conducted on installing fittings for tapping and stopping off pressurized steel pipelines. During the other program modules, facilities were visited such as a petrochemical plant, an engine-turbine installation and a pipeline company compressor station.

Lecturers for the program are largely drawn from the IGT staff and its consultants. Guest lecturers from industry are also used where appropriate to provide additional operating experience.

It is anticipated that the program will be offered in the future with an open enrollment rather than being limited to a group from a single nationality. Also, students may enroll for selected modules if they do not wish to take the complete program.



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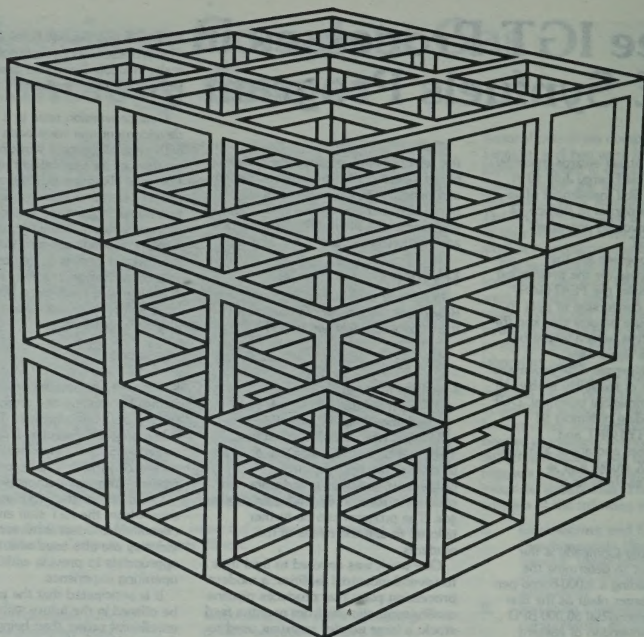
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Deploying a Synfuels Industry

Presentation at the Thirty-Ninth Annual Meeting of
Members and of the Board of Trustees of the
Institute of Gas Technology

IIT Center
Chicago, Illinois
November 13, 1980

IGT

DEPLOYING A SYNFUELS INDUSTRY

A Discussion by Representatives
of Government and Industry at the
Thirty-Ninth Annual Meeting of Members
and of the Board of Trustees of the
Institute of Gas Technology

Grover M. Hermann Hall
IIT Center
Chicago, Illinois 60616
November 13, 1980

SPEAKERS

Dr. Bernard S. Lee, Moderator
Dr. Ruth M. Davis
Mr. W. J. Bowen

LUNCHEON ADDRESS BY

The Honorable Charles B. Curtis
Chairman

Federal Energy Regulatory Commission



Dr. Bernard S. Lee
President
Institute of Gas Technology

Good morning ladies and gentlemen, Member-company representatives, Trustees, friends of IGT and other distinguished guests...greetings and welcome to our morning symposium traditionally held in association with our annual meeting of Members which immediately follows this program.

Unlike many of the technical symposia organized by IGT during the year, in which we hope to bring forth the latest research findings in a given discipline, our annual meeting symposia are intended to shed light on energy concerns of a broader, more public and topical nature. Not only is this year's subject in that mold, it is perhaps among the most pressing public policy considerations before the nation. It is a proper concern of scientists, environmentalists, the private sector, government at all levels, and the man on the street. Indeed, let everyone ask: Why, when and how should a United States synthetic fuels industry be deployed?

This program will elicit views on that question. I will remark from the perspective of energy R&D. Dr. Ruth Davis, DOE's assistant secretary for resource applications, will represent the view of the federal government, and Jack Bowen, chairman of TRANSCO Companies, will speak from the viewpoint of the private sector. Then we will gather for an informal discussion of the issues raised.

I elected to speak first not only for the practical reason that I'm already on stage and can avoid two entrances, but also

because R&D is the linchpin of virtually any industrial enterprise. I'll discuss the need for continuity in R&D, the evolutionary nature of R&D, the need to match synfuels products with energy needs, the examples of other countries in meeting problems similar to ours, and the direction that synfuels deployment must take.

We need to preserve continuity in energy R&D to foster better, more efficient and more appropriate ways to meet our energy needs. Our nation has been trapped in the past when we failed to address a problem before it was upon us. A good example is Pearl Harbor, which caught us unprepared, practically defenseless, and propelled us into a synthetic rubber industry and gasoline rationing. Now, a Mideast war seriously threatens the energy supply of the free world at a time when the U.S. is painfully import-dependent. We have the resources and the technology to reduce the threat to manageable proportions, but we have lagged in deploying those resources. We remain gravely vulnerable.

The critical issue is the lead time for getting major new energy supply sources in place. No matter how hard we push, it would be seven or eight years before synthetic fuels could provide meaningful increments of energy supply. We must accept at least another decade of energy dependence with the associated economic deprivation and threat to our national security. Our vulnerability beyond that point will equal precisely the extent to which we delay now. The irony is that we allowed ourselves to be so trapped despite our rich endowment of energy and human resources. While this is true in a national sense, we can look with pride to the gas industry which has tried for 10 years to get a synthetic gas-from-coal industry started. Note that the Great Plains gasification plant will be the first commercial, high-Btu plant in the U.S.... and that advanced technology for producing medium-Btu gas from coal will be demonstrated at Memphis.

In order to meet future energy needs, we must maintain and strengthen our commitment to continuing research and development in all sectors of energy -- conservation, conventional and unconventional supplies, synthetic fuels from coal, oil shale and biomass, and the solar and nuclear options. Continuity of development is particularly important for synthetic fuels because they will be the major sources to supplement conventional fuels for the next 50 to 100 years. The initial wave of commercial synthetic fuel plants will necessarily be based on commercial processes which were developed some years ago. There are many new technologies in various stages of development which offer higher efficiency, lower cost and which will tap unused resources. But before they can be commercialized, they must be carried through the laboratory, pilot plant, and demonstration phases. If R&D continuity is not sustained, we will lose time, disperse the teams of scientists and engineers who are creating the new technologies, and inevitably lose much hard-gained knowledge. We must try technologies on a sufficiently large scale to determine their

technical, economic and environmental feasibility. Many promising approaches have been placed in limbo because funding was cut off before they were tested at an appropriate scale. Also, we must recognize that success will be punctuated by some set-backs along the way. Only by accepting this fact can we be sure of a continuing stream of innovations and improvements.

Bear in mind too that synfuels technology development is evolutionary. Our perspective and R&D goals are constantly modified as we gain deeper insights from the expansion of our knowledge. Yet, we must use this knowledge at the time it is called for; we must respond with the cards we are dealt. In planning R&D, we cannot wait until the perfect process is developed before putting it into practice. If we had waited until the perfect automobile was developed, we would still be riding horses. The evolutionary nature of progress can be seen in every aspect of our lives - in industrial processes, consumer goods, agriculture, transportation, and lifestyle. We must apply the same rationale of development to the synthetic fuels industry but at an accelerated pace due to the short time available to us.

A major reason to continue and even accelerate R&D on synthetic fuels is that the bulk of our resources are in solid-form -- coal, oil shale, peat and biomass. However, much of our in-place energy transmission, distribution and utilization system, representing an investment of hundreds of billions of dollars, was designed to handle liquid and gaseous fuels. We can expect new systems, such as coal slurry pipelines, to meet part of future energy needs, but it just makes good economic sense to provide liquid and gaseous synthetic fuels so the present systems can be utilized fully in the future.

In structuring national programs for energy research and development, we must strive for a fuel mix that responds to our real needs. Misperceptions on this point are common. In addition to the erroneous position that one form of energy or another will replace all others, there is a general lack of understanding concerning the interchangeability of fuels, the time when certain energy forms will be available, and a pervasive ignorance of energy economics. Another common blind spot is the failure to recognize the relative potential contribution of the various energy options. We at IGT believe strongly that our nation must have a broad base of energy supply sources, each developed to the commercial stage, and each backed up by a continuing flow of further improvements. For the long-term we are actively engaged in producing fuels from renewable sources, such as solar and biomass, through biological as well as thermochemical conversion to liquid and gaseous fuels. But we also recognize the need, in the nearer term, to develop processes to produce synfuels from our abundant fossil resources in coal, oil shale, and peat. We feel that a national consensus has emerged which acknowledges the role of synfuels in a secure national energy supply posture. We would like to think that some of IGT's work brought forth advanced and timely technologies, now will be doubly encouraged. For example,

our HYGAS process for high-Btu gas from coal for pipeline transmission, U-GAS for medium-Btu gas for industrial fuel or chemical feedstock, HYTORT for economically opening up the vast Eastern shale reserve to produce liquids and high-Btu gas, and PEATGAS for tapping our huge peat resource to produce high-Btu gas. It seems to us that these are ideas whose time has come.

We believe the only rational approach is to maintain a balanced research, development and demonstration program so that new energy technologies will provide a balanced mix of required fuels and conservation measures when needed, based on the economic goal of the lowest total cost to the consumer and to the nation as a whole.

To get a feel of how our energy research and development programs should go, we can look at what other countries are doing. The message that comes through is maximum use of indigenous resources. France is energy-poor and has concluded that nuclear energy is the best option to reduce its dependence on imported fuel. It is now a world leader in fast breeder reactor technology. Germany has embarked on a two-pronged program to increase the use of indigenous coal resources and develop nuclear power at a rapid rate.

Brazil is another good example. It imports most of its oil, a large part of which is required to meet transportation needs. The Brazilians have embarked on an ambitious, but achievable, program to meet transportation requirements by using alcohol produced from biomass. Finland and Sweden have major programs under way to greatly increase the use of peat to provide an increasing increment of energy supply. The world leader in synthetic fuel production is South Africa. That country will meet half its liquid fuel needs with synfuels from coal when the Sasol II and III plants are completed in 1982.

Now let's look at America's energy R&D program. First, there is still a disproportionate percentage of federal R&D funding for technologies to produce electricity compared to other energy options. Nearly 80 percent of DOE's fiscal '80 budget for total energy supply technology was for electricity, say out of proportion to the 11 percent of U.S. end-use energy consumption served by electricity.

On the positive side, a number of demonstration plant projects utilizing coal are under way, most notably the Memphis medium-Btu coal gasification plant, utilizing IGT's U-GAS process, and the SRC-I and II plants to produce solid and liquid fuels from coal. Also, feasibility studies are being conducted to investigate the production of gaseous and liquid fuels from a variety of feedstocks using both commercial and advanced-technology processes. A number of cooperative projects with foreign countries are under way. Energy R&D is moving forward on a broad front, and many energy options are being explored. However, besides the weighting toward electricity, I am concerned that current research and

development is heavily oriented towards liquids production due to pressure from the oil import problem. It neglects the fact that gaseous fuel can back out oil imports Btu for Btu and can do so more cheaply.

For some months now I have promoted a deployment plan which takes cognizance of this fact and deals also with the caveats and requirements I have cited to this point. This program would fully meet the Synthetic Fuels Corporation's goal of 500,000 bbl/day of oil equivalent by 1987 and 2 million bbl/day by 1992.

It would achieve these goals through two waves of deployment. The first wave consists of deploying several commercial plants using currently-available technologies, while simultaneously deploying demonstration plants using advanced technologies to establish their commercial viability. In the second wave, in the late 1980's, commercial plants based on demonstrated advanced technologies would be built. Those firstwave commercial plants would still be economical because of the cost escalation during the time when advanced technologies are being demonstrated. These plants will also provide a real reference for production cost, performance and environmental data. The second-wave commercial plants will be more efficient and cheaper than the first wave and will be the basis for the competitive growth of the synthetic fuels industry.

Some of my specific recommendations are:

- First - at least half the target goal should be in synthetic gases, because:
 - gaseous fuels can be substituted directly for oil in essentially all stationary applications,
 - gas represents a finished product of high form value, and
 - the cost of gas production is lower than that of liquids.
- Second - the fossil resources in the East should be strongly emphasized because:
 - the recoverable coal and shale resources in the East are at least as great as those in the West,
 - water is much more available in the East.
 - markets are much closer to the points of production in the East.
 - the skilled manpower pool and manufacturing resources are greater in the East.

Third - to fully utilize coal, both high- and medium-Btu gasification plants should be on-stream. Medium-Btu gas plants can economically serve industrial users concentrated within a relatively small radius, while high-Btu gas plants can be connected to the existing natural gas transmission and distribution network to serve residential, commercial and industrial users.

Fourth - to achieve the 50 percent reduction of oil use in utility boilers, a logical approach is to replace oil with clean fuel gas from Eastern coal, since many of these boilers are concentrated in the East. At least half of the reduction target should be met by advanced gasification and combined-cycle technology that not only provides clean fuel but also higher efficiency of power generation.

Under this deployment plan, after the first wave, we could have a synfuels production capacity of 520,000 barrels per day of oil equivalent by the late 1980's, very close to the current target of 500,000 barrels by 1987. The total after the second wave deployment would be 2,050,000 barrels per day by 1992, again very close to the current target of 2,000,000 barrels per day by 1992. The mix of gaseous vs. liquids is about 50-50, and the capital investment, in today's dollars, excluding mining investment, would be about \$100 billion. This figure is very close to the planned funding of the Synthetic Fuels Corporation.

A massive commitment of financial and human resources will be necessary to carry out this ambitious program. Since time is short, action must start immediately to resolve the regulatory and institutional constraints. A rational and workable balance between environmental and energy goals must be established and maintained. Through the cooperative efforts of government, the private sector and the R&D community, we can accomplish these objectives. The benefits will be that our supplies will be more secure, our national defense posture will be strengthened, the price rise of imported energy will be moderated, and the U.S. can formulate and implement national and international policy free of the constraints imposed by overdependence on imports.

In summary, we have a large and rapidly expanding technological base for synthetic fuels production. Let's get on with it.



Dr. Ruth M. Davis
Assistant Secretary for Resource
Applications
U. S. Department of Energy

Good morning. Let me say how pleased I am to be here because I share all of Dr. Lee's beliefs about the importance of a synthetic fuel industry. I really should comment immediately, however, that on the plane coming out here, thinking about what I would say, I was reminded of a Robert Louis Stevenson verse that I learned when I was very little. It started out something like, "Between the dark and the daylight, when night is beginning to lower, there comes a pause in the day's occupation that is known as the children's hour." I think you are hearing me speak in the equivalent "pause" between an election and an inauguration day.

Although I'm not a child, I'm in the place perhaps of where that child should be when it's supposed to be a little bit quiet about what it's going to do next. I've been through three transitions from one party to another party in the Executive Branch. I've never been through one in the Senate. I've learned what is important to concentrate on during this "pause" in the day's occupation. First, what is in an area as important as energy? What is seemingly independent of party interest? What is of national urgency that transcends a party's particular interest?

Second, one should concentrate on what has been accomplished and what is being accomplished. Third, avoid with the greatest footwork conjecture on what the future is going to hold. It is

within the context of these few truisms that I will be commenting to you this morning. You can recognize the footwork in place because I'm the only one of your three speakers who doesn't have any slides. Therefore, I'm going to be able to be totally "real-time" in what I say.

I think it's important to point out to you that both political parties and everyone in the government and everyone outside the government who is working with the government now recognizes that business must go on. Yesterday, the first meeting was held at the White House between the members of the transition team and all the members of the government's transition team, including our member from the Department of Energy. We're going to be working together, all of them and all of the present administration, to keep the nation's business going which is really important.

I've been involved with research and development, either directly or closely, all of my professional career. I can say that the most difficult part of the process between research and development and finding the products of that research and development in our hands as consumers, is the transition between what we call demonstration or advanced development to production. As a nation, we haven't done very well in that regard with energy. We have some superb research and development programs and we have an absolute national urgency with respect to getting energy supplies that are under our own control into our hands as consumers. Yet we haven't done well at all in making that transition between development, demonstration and production.

There are a number of reasons that it's difficult. I'd like to chat with you about a few of them. Let me comment about an exception, of course. In the area of nuclear energy, the nuclear R&D program of World War II has, of course, found its way into the marketplace of thermal power plants for electric utilities. And so we see at least one example that we can say as a nation that we have crossed that bridge into production. I don't think there's any other good example.

In terms of what is the respective role of government versus industry, I don't think there's an optional answer. I do think there are a number of good answers that will work. I would heartily endorse or encourage a good answer, rather than wait for the best.

The manner in which industry and government are involved, working together, occurs through two different types of mechanisms. One is based on whether or not the government is involved as a customer or whether or not the government is setting marketplace goals. If the government is neither of those, then you find most of that transition between R&D and the marketplace is probably in industry.

In the case of where the government is the customer, our best example is the Department of Defense where you procure tanks you're going to want over a period of 10, 15, 20, 30, 40 years. And you have a reason for building an industrial base. If you're talking about aircraft you have that same kind of marketplace as a consumer that gives you some credibility to investors in development. It gives you some credibility in the R&D community. The Energy Department doesn't have that credibility and it can't have it because it's not the customer for energy products.

The other mechanism by which the government gets involved and affects the R&D community, as well as affecting the producers, whether they be existing manufacturers, existing oil companies or whether they be new entrepreneurs, is setting a marketplace goal that is independent and different from that which is happening in the marketplace. This is what the United States government has done today. It has said through both Congress and the Executive Branch, we want the numbers that you saw your president (Dr. Lee) show on his slides. We want 500,000 barrels of alternative fuels by 1987. And we want two million barrels of oil equivalent by 1992.

Now, when you say that, you admit immediately that the industry is not progressing towards that goal. When you set that kind of a goal, you really require some kind of government intervention. When the government intervenes, the government then has to decide what it must do in terms of research, in terms of development, in terms of marketplace strategy to achieve the goals that it thinks essential for the nation.

At the moment, the Department of Energy and you, people in the entire industrial establishment, Congress, everybody is sort of struggling to try to decide what it is that government should do and what it is that industry should do. I don't think we have a single answer. Here again, on the basis of experience, I would strongly stress that we not try to find a single answer. I think the answer is entirely different when you're talking about alcohol fuels or burning of municipal waste than the answer you should come up with when you're talking about synthetic fuels in the gaseous form as opposed to synthetic fuels in the liquid form.

I think there are many answers to the role that government should play and there are many answers to the role that industry should play. It's like saying how many angels can dance on the head of a pin to try and find a single answer. I believe that we've spent too much time trying to find a single answer.

Now what has been the answer to date on the part of the government? I don't think there has been an answer that is acceptable either to the government or to the private sector. The answer has been several-fold. One is that the Department of Energy was set up. Within that Department I tend to use the phrase that was brought over from ERDA called "commercialization."

I happen to have gone to the Department of Energy last year and inherited the organization and products that it was supposed to commercialize. That is the transition from development and demonstration plants to marketplace products. I think that is a terrible word for the government to use. I don't think the government can commercialize anything. I think it's going to be very difficult even for the private sector to commercialize these kinds of energy sources.

The problem I have with the English language is that I haven't been able to find a good substitute for "commercialize." I tried "industrialize" and that's doing pretty good. It has a better feeling because "industrialize" means the government should be helping the private sector set up industries that can produce the product. It has a much better connotation than "commercialize" because "commercialize" has the implication that what you're doing is marketplace-economic. I'm not too sure that anything we're going to be doing in providing the kinds of sources for oil and gas is going to be marketplace-economic for many, many years. That's the difference between marketplace-economic and national-economic. Your president (Dr. Lee) referred to that in his talk. He talked about national requirements. Nationally economic means "what on earth are we going to do to our industrial base if we don't get synthetic gas and synthetic liquids on line?" What on earth are we going to do as a nation if we don't have the electricity that allows us to exist in our offices and in our homes the way we are used to? What on earth are we going to do industrially if we don't have some kind of replacement for natural gas that's running out or that we have to import?

So, nationally economic -- I think we're there already. Marketplace-economic -- I have no idea when we'll be there. It's a very capricious market. As R&D salesmen -- and the Institute of Gas Technology has a marvelous R&D product -- you can't sell it on the basis of synthetic gas in the economic marketplace because it's one of the few marketplaces we don't control in this country. Generally you can look and you see a competitive marketplace. Or you see an oligopolistic marketplace, or you see a monopolistic marketplace. You know how to enter that marketplace, you know what to do with new products, you know what to do to get more competition or less competition depending upon what your goal is.

We don't have control over the energy marketplace. It's a product of economic warfare by other countries and it will remain so. And therefore one is going to have to look at the economics in terms of what this country has to prepay as a government to subsidize and make that marketplace one in which there is a capability of using the kind of R&D that's coming out of the Institute of Gas Technology.

The Department of Energy was set up under several statutory laws. From my point of view, and it's based on experience,

the statutory laws under which the Department of Energy is set up make it impossible for allowing the kinds of government intervention in the marketplace that will industrialize fuels or industrialize synthetic fuels, or industrialize solar, or industrialize anything that you're talking about.

The statutory requirements allow the Department of Energy to do fairly well in R&D. I think the kinds of grants, kinds of activities that you all have from the Department of Energy are exemplary of that in IGT. The kinds of financial incentives and marketplace incentives that the Department of Energy has been allowed to pursue, the kinds of ways in which the Department of Energy can hasten the processing for regulatory requirements, licensing, permitting, getting lands, exchanging Federal lands, so that you have a place in which you can get enough feedstock whether you're talking about coal or gas or whether you're talking about shale or shale oil, that kind of capability is simply not there in the statutory laws that now govern DOE. Not only is it that bad but it's almost impossible to make happen in any usable manner. Therefore, you see that the Department of Energy, and therefore the country as a whole, has so far struck out in the energy marketplace for alternative fuels.

But not in the R&D marketplace. What we have done -- and there have been some very insightful Congressmen and Senators -- what we've done is catch up a bit on those laws. And we have, under my jurisdiction, a program that started just a year ago, November 27. I got confirmed on the 26th of November and I got \$2.2 billion on the 27th for feasibility studies and cooperative agreements. We've made two awards for feasibility studies for high-Btu gas production and we made awards for seven feasibility studies for low- and medium-Btu gas production. That's a total of \$22.3 million for synthetic gas. In the same round of solicitations, we made two awards for cooperative agreements for high-Btu gas. They total \$34.1 million and I think that's great because that's part of the process.

Feasibility studies are for the beginner and the amateur, the innovator. Cooperative agreements mean you've gone past the first benchmark and you are now at a stage of time when you decide where, how and what is involved in constructing a plant. We have \$300 million more that we're using right now for that kind of function and I hope to have the department announce the awards for that the first week of December.

In that round we have received an application for a cooperative agreement for a high-Btu gas project and we've received three applications for low- and medium-Btu gas projects. I remind you that without applications, we can't fund projects.

Assuming that certain conditions are met, we have agreed to fund at a 3:1 leverage a \$1.5 billion loan for the Great Plains Gasification project. The recommendations for what to do on that

program have been completed. I've signed it out and it's on its way to the Undersecretary for his final decision which could occur at any moment.

The \$2 billion dollars that I mentioned was increased to \$5 billion in order to have a program that would allow for synthetic fuels for direct national defense needs, namely, liquid fuels. We have gone out in an unheralded way for the Department of Energy. We went out on a 30-day solicitation. Those proposals for that \$5 billion, \$3 billion for the Defense Production Act, and \$2 billion under the Non-nuclear Act, are due in on November 14th which is tomorrow.

I want very much to have some conditional commitments. I have no reason to assume that we don't have the capability of making conditional commitments for all kinds of synthetic fuels under that particular project by the end of this calendar year. I have a team of several very capable groups. I have enlisted the support of the Department of Treasury, the Department of Defense and the Department of Energy. We have a fast-track activity underway to evaluate those proposals and get some conditional commitments made by the end of this year.

That's a great start. That's putting the government's money where its goals have been for the first time. That would be \$5.5 billion in one year that Congress has said to use. In one year, my part of the Department of Energy with the tremendous support of the Secretary of Energy has made the largest part available and wants to make the rest almost entirely available to the private sector by the end of this calendar year.

Are we there yet? No, of course we're not there yet. We have the Synthetic Fuel Corporation that's just getting going. The Synthetic Fuel Corporation contains the hope for getting synthetic fuels on line and for taking proven technology that will come from R&D and getting it into the marketplace. Will it be able to succeed? Sure. Will it be able to sell its products? Absolutely. What's it going to take in either case? It's going to take a tremendous difference in the kinds of constructed interrelationships between government and industry than we've ever had before.

We have a number of laws in this country, preferably so, on the interrelationships between companies and companies, and in the interrelationships between government and companies. I'm not too sure what is in that framework of laws to enable us to do what we have to do as fast as we'd like and think we need to do it in the energy industry. But we'll see.

I have a feeling that if something turns up that requires a different kind of relationship between government and industry, that we can arrange this. They're nice relationships. They're loan guarantees, price supports, purchase commitments. But I

remind you, for a price support or purchase commitment you have to have a buyer. The only buyer the government has is the Department of Defense. If you're going to provide price and purchase guarantees then you're going to have to find them in a marketplace. You're going to have to find them among existing users of oil and natural gas.

I think it's a tremendous problem that people haven't faced up to. Where are the buyers that are going to allow us to make this purchasing price commitment? The Synthetic Fuel Corporation is going to make it possible for us to get synthetic fuels on line. But there's still a tremendous need for a number of different kinds of financial incentives, needs, tax incentives. There have to be ways of depreciating capital more rapidly. Experience as well as new and innovative industries have to be brought into the picture much more than they have been. This is not yet a technology-driven industry. Only in the nuclear areas so far has the energy industry really been technology driven.

It's up to organizations like IGT. It's up to organizations that are trying to develop the technologies whether they be for mining, manufacturing or processing, whether they be for entirely new sources of energy, such as solar or fusion. It's really up to the R&D community to both push the industry, to both help industry get formed in these areas in which there are no companies and therefore no industries, and to simultaneously recognize that it is almost always marketplace-pull that gets R&D off the R&D bench and into the production line.

We've learned a lot about energy in the last several years. I've been primarily in the Department of Defense in that time but as a government, as an R&D community, and as a nation we have learned a lot about energy. Everything, however, that we have to do still lies ahead of us. Everything we have to do is dependent on getting that process to be a continuous process, from R&D through demonstration and development into the first commercial application, into the marketplace and then into the hands of the consumer. We can't afford not to succeed. I think no matter where we find ourselves in the next three or four years, our main national attention has got to be towards energy R&D and it's got to be towards a synthetic fuel industry, it's got to be towards the energy marketplace.

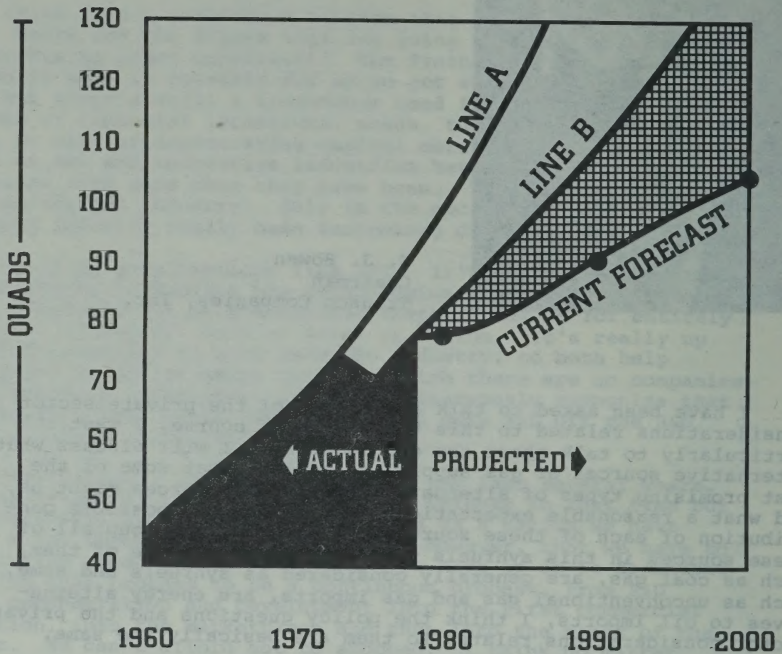


W. J. Bowen
Chairman
Transco Companies, Inc.

I have been asked to talk about some of the private sector considerations related to this topic and, of course, I want particularly to talk about the gas industry. I will discuss what alternative sources of gas supply are needed, what some of the most promising types of alternative gas supply sources might be, and what a reasonable expectation might be for the possible contribution of each of these sources. I am going to group all of these sources in this synfuels talk because while some of them, such as coal gas, are generally considered as synfuels and some, such as unconventional gas and gas imports, are energy alternatives to oil imports, I think the policy questions and the private sector considerations related to them are basically the same.

First of all, are these relatively high-cost sources of gas supply really going to be needed? Let's take a look at the energy consumption picture in the United States. As you can see in Figure 1, United States energy consumption is growing, even though at a much lower rate than it did previously. If you will look at line A you will see the energy consumption growth rate of four percent that might have been expected prior to the first Arab oil embargo. If you will look at line B, you will see an energy forecast at historical usage, that is the rate of GNP growth and the rate of energy growth roughly holding a one to one relationship, but with the GNP growth forecast lowered to three percent per year as opposed to the pre-embargo long-term rate of about four percent per year. Then if you will look at some of

U.S. ENERGY CONSUMPTION 1960-2000 (QUADRILLION BTU)



CONSERVATION EFFECT

FIGURE 1

the other fairly recent forecasts shown on this figure, you can see that the expected conservation effects are substantial. The current forecast reflects expected energy consumption of about 90 quads in 1990 and about 105 or so quads in the year 2000. Look at the shaded area between line B and this current forecast. That area can be attributed to conservation savings. Based on this forecast of energy consumption, the United States will not be able to produce enough domestic conventional energy to satisfy our needs. If we look at Table I, we can see that the United States might reasonably expect to produce about 69 quads of

domestic conventional energy by 1990; up from the current rate of about 59 to approximately 81 quads by the year 2000. Comparing this production estimate with our consumption estimate, we see that there is a substantial gap which we will have to fill with some other form of energy. Of course, our current method of filling this gap is primarily to take a large dose of imported OPEC oil; a very expensive and distasteful medicine for our ails.

TABLE I

DOMESTIC CONVENTIONAL ENERGY PRODUCTION
(Quads)

	1980	1990	2000
Oil + NGL	19	18	17
Coal	15	24	35
Nuclear	3	7	10
Hydro, Solar, Geothermal	3	4	6
Lower 48 Natural Gas	19	16	13
	59	69	81
Demand	77	90	105
Requirement	18	21	24

The message that we in the United States are finally coming to realize very clearly now is that our country cannot afford to continue using oil imports on such a large scale to fill this gap. The costs are simply too high in terms of dollars, and in terms of national security. On the dollar side, I think we too often tend to think of oil imports as costing \$30.00 a barrel, \$37.50 a barrel, or whatever the price tag is, without really taking full account of the economic problems that our dependence on foreign oil has caused.

Let's contrast the economic conditions through the late 1960's with those that existed through the late 1970's. (Table II) In the late 1960's, the United States was importing 2.5 to 3 million barrels per day of cheap imported oil. The price tag for this oil was around \$2.00 per barrel. In fact, the price of oil imports was as low as \$1.00 per barrel in 1969. Domestic production, including natural gas liquids, was over 10 million barrels per day. This gave imports 20 to 25 percent of oil supply and just over 10 percent of our total energy demand. GNP growth averaged over four percent a year through the 1960's. Inflation as measured by the Consumer Price Index averaged 2.4 percent through the 60's, although it was up to 5.4 percent for 1969.

By the late 1970's, the United States was importing over

TABLE II

ECONOMIC CONTRAST1960's vs. 1970's

	Late 1960's	Late 1970's
Oil Imports	2.4-3.2 MMB/D	8+ MMB/D
Cost/Bbl.	\$2 ±	\$30 by end 1979
Oil Imports as % Oil Supply	20-23%	45% ±
Oil Imports as % Energy Supply	10%	25%
	<u>1960-1969</u>	<u>1970-1979</u>
Average % Growth Rates:		
GNP	4.3%	3.2%
CPI	2.4%	7.2%

eight million barrels per day of not-nearly-so-cheap petroleum. In fact, the price was up to about \$30.00 per barrel by late 1979. Domestic production, including NGLs, was still about 10 million barrels per day, but now imports were almost 50 percent of petroleum supply and almost 25 percent of total energy demand. GNP growth rate slowed to an average of only about three percent through the 70's and the Consumer Price Index averaged over seven percent growth for the seventies (and was up to 13 percent for 1979). Now, the fact that the United States government simply decided to print more dollars for us to export in exchange for oil, without exercising realistic fiscal or monetary restraint, was a key factor in this economic erosion; but the fact that a problem exists is clear. Measuring the total impact of the problem is less clear.

Last year, IGT made an attempt, which has recently been updated, to estimate the overall impact of oil imports on our economy. This estimate takes into account all the benefits that could be realized by reducing oil imports, in this case, an assumed 500,000 barrels per day. What this analysis has done, is to make an estimate of the total economic benefits available from this reduction of oil imports, divide this dollar value benefit by the total barrels saved to come up with an estimated dollars-per-barrel benefit. All of these figures are in constant 1980 dollars. The direct benefit, which is shown on the top line of Table III, is fairly straightforward. That's the direct cost of the oil. The other items in Table III, the external benefits, are not quite as easy to get a handle on, and I won't try to represent to you that such numbers can be correct to two decimal places or even one decimal place. But, this is possibly the best

TABLE III

DIRECT AND EXTERNAL BENEFITS OF
REDUCING OIL IMPORTS INTO UNITED STATES
BY 500,000 BBL/DAY
(Modified)***

	\$/bbl (1980 \$)		
	Year 1	Year 2*	Year 3
DIRECT BENEFIT			
● Reduced Oil Imports**	30.00	30.60	31.21
EXTERNAL BENEFITS			
● Improved Trade Balance + Currency Appreciation + Lower Inflation	7.02	12.96	13.57
● Lower Oil Prices	8.89	12.74	13.63
● Added GNP	4.16	8.00	10.87
● Decreased Supply Disruption Cost	6.00	6.00	6.00
TOTAL	26.07	39.70	44.07
TOTAL PER BARREL BENEFIT	56.07	70.30	75.28

*In each succeeding year from Year 1, oil import demand reflects the original 500,000 bbl/day reduction

**The estimated average price of oil imports in 1980 is estimated at \$30/bbl and is assumed to rise in real terms 2%/year.

***Original table from October 1, 1979, issue of "IGT Energy Topics," modified to 1980 \$ and estimated world oil prices.

attempt that I have seen to estimate the overall effects of oil imports.

Dr. Lee has explained how IGT analyzed those external benefits outside the direct producer-consumer transactions that impact the entire nation. Notice that the first year benefit is about twice the direct cost of the oil, and in following years the benefits exceed twice the direct cost of the oil. Again, I won't try to argue that these items can be estimated with great accuracy, but I will say that this is a reasonable attempt to measure the total economic benefits available from reducing oil imports. And if you accept the idea that, in the long run, oil imports cost all of us a great deal more than just the out-of-pocket dollars per barrel, then an analysis such as this provides

a much more realistic comparative price against which supplemental energy projects can be measured. Simply stated, if a domestic project can produce energy at a cost less than the benefits which can be realized by reducing oil imports, then our country ought to develop policies which favor that domestic alternative. It just makes long-run economic sense. Besides making economic sense, it is much harder to quantify the national security benefits, which are extremely important, and those benefits that would be available above and beyond these economic benefits. I think those of us in the private sector, and now, I believe, many in government, realize that our policies have to favor domestic alternatives; long-term strategies to solve our problems rather than just short-term quick-fix attempts at solutions.

Now, moving from this rather dark background which says that, under our current conditions, we can't produce enough domestic conventional energy and our current solution to filling this gap is much too costly, can the United States expect to do anything? First of all, let's take a look at our basic energy resources of oil, gas, coal, uranium and syncrude. Table IV, which I borrowed freely also from IGT and some other sources, shows where the United States stands in terms of total energy resources. We are talking about proven plus the most likely resources left to be found and recovered. There are two key figures on this table that I want you to focus on. One is the United States percent of world total energy resources -- 22.4 percent. The other is the entire Middle East percent of world total energy resources -- 4.5 percent. That says that the United States has roughly five times the energy resources of the entire Middle East.

Looking at the breakdown you will see that most of our energy resources are in coal, as opposed to petroleum and natural gas in the Middle East, but the point is that we do have plenty of energy resources. The next point is that we have the technology to do things with these resources. The problem right now is that we don't have the long-term policies to ensure development of these resources.

Let's step back a minute and take a look at the role the gas industry can fill in this energy future. First of all, let's consider Lower 48 production, the domestic conventional source of methane which has made our industry run for so long. Table V shows a consensus forecast put together by the A.G.A. and some pipeline and producing companies which compromised at the forecast included in the National Energy Plan II. That is, that the current production of about 19 quads or TCF per year will drop off to about 16 in 1990, further to about 13 quads in the year 2000. This is even taking into account the higher drilling rates and the improved prices for natural gas.

Beyond Lower 48 production, let's go into alternate sources of gas supply, or supplementals. The first one listed in Table

TABLE IV

WORLD NONRENEWABLE ENERGY RESOURCES
AS OF 12/31/77

Estimated Total Remaining Recoverable Resources

WORLD TOTAL		10 ¹⁸ BTU	% of World Total
Natural Gas (TCF)	9205	9.48	5.6
Natural Gas Liquids (Billion Bbl)	258	1.03	0.6
Crude Oil (Billion Bbl)	1747	10.13	6.0
Syncrude (Billion Bbl)	2320	13.46	7.9
Coal (Billion short tons)	5920	133.95	78.9
Uranium Oxide (Thousand short tons)	4062	1.63	1.0
TOTAL		169.68	100.0

UNITED STATES		10 ¹⁸ BTU	% of U.S. Total
Natural Gas (TCF)	965	0.99	2.6
Natural Gas Liquids (Billion Bbl)	27	0.11	0.3
Crude Oil (Billion Bbl)	258	1.49	3.9
Syncrude (Billion Bbl)	1041	6.04	15.9
Coal (Billion short tons)	1412	28.68	75.5
Uranium Oxide (Thousand short tons)	1705	0.68	1.8
TOTAL		37.99	100.0

Percent of World Total = 22.4%

MIDDLE EAST		10 ¹⁸ BTU	% of M.E. Total
Natural Gas (TCF)	2430	2.51	33.1
Natural Gas Liquids (Billion Bbl)	68	0.39	5.2
Crude Oil (Billion Bbl)	805	4.67	61.7
TOTAL		7.57	100.0

Percent of World Total = 4.5%

1. Source ("IGT Energy Topics" May 7, 1979).
2. Data are based on a variety of published estimates, such as U.S. Bureau of Mines, U.S.G.S., World Energy Conference and the United Nations.
3. Remaining recoverable resources include proved reserves.
4. Communist countries' uranium resources are not included due to lack of suitable data.
5. Middle East includes Saudi Arabia, Bahrain, Iran, Iraq, Israel, Kuwait, Neutral Zone, Oman, Qatar, Syria, Turkey, United Arab Emirates.

TABLE V

CONVENTIONAL LOWER 48
GAS PRODUCTION
(Quads)

1980	1990	2000
19	16	13

(A.G.A. and NEP II Estimates)

VI A is Alaska gas, which is, of course, only called supplemental because right now it can't be brought to market. This is a clear example of a project where our policymakers need to recognize full economic and national benefits of bringing an available domestic resource to market. The pipeline financing can move forward if the policy situation is proper. Once this gas is sure to be brought to market, we can expect producers to add to the existing 30-plus TCF of reserves. From these reserves, we expect production can be as high as 1.4 TCF by 1990 and up to almost 3 TCF by the year 2000.

TABLE VI A

SUPPLEMENTAL SOURCES OF GAS SUPPLY

	1980	(Quads) 1990	2000
1. Alaska	—	1.6	2.8
• Available Domestic Resource			
• Needs Pipeline Financing			
2. Pipeline Imports - Canada and Mexico	1.2	2.1	2.0
• Pricing Issue Settled			
• Substantial Reserves			
• U.S. Natural Market			

The next source of gas supply listed in Table VI A is pipeline imports from Canada and Mexico. Admittedly these are energy imports, but they have preferable features to oil imports because of the common problems we share with our North American trading partners, Canada and Mexico. We can realize better dollar recycling. These are non-OPEC sources of energy. They are close to our market and they are supported by big reserves. From these we expect the current one TCF or so can grow to two TCF by 1990 and remain there for quite some time into the future. Still this

foreign source is only about 10 percent or less of our total gas supply.

Another potential source of gas imports is LNG as shown in Table IV B. Again, this is an imported source of energy, but it holds some significant advantages over oil imports. There are more non-OPEC sources available for future projects. It has been shown that better investment recycling is available to U.S. companies, and because of the specialized nature of the LNG shipping and receiving hardware, there are some supply security advantages over oil imports. Still, this forecast, which shows less than 1 1/2 TCF by 1990 and just over 2 1/2 TCF by 2000 is a low percent of total gas supply. You see here a listing of some LNG projects. Notice that there are quite a few non-OPEC possibilities listed.

Synthetic natural gas from liquids. There are presently about 14 United States plants using naphtha or natural gas liquids to make substitute natural gas. These plants have a capacity of just over 500 BCF per year and since some are for peakshaving and not operating full time, a reasonable expectation is probably that these plants can continue to operate and produce 400 BCF per year.

The next source of supplemental gas to consider, coal gasification, is shown in Table VI C. It is probably the gas industry's biggest hope for participation in a synthetic fuels industry, and also probably the best way for us to apply proven technology to our vast energy resources to the benefit of the country and the gas industry. I think we would all agree that the direct burning of coal is going to expand significantly, but there is still a very large role that coal gas can play. The environmental advantages of using coal gas as opposed to direct burning of coal, particularly in populated areas, are very substantial. Many transportation problems which exist with direct burning of coal are also eliminated because we are fortunate to have in place an existing national pipeline transmission and distribution network which can accept high-Btu gas immediately. Medium-Btu gas can also be produced and pipelined reasonable distances as an economical industrial and utility fuel. I think one of the important things that we always need to keep in mind in discussing coal gasification is that because a substantial part of the cost of coal gas is related to the capital cost of the plants, once this capital is spent and the plant constructed, those dollars are sheltered from future inflation. Therefore, coal gas is expected to escalate in cost at a much lower rate than most forecasters see for petroleum. This means that within a reasonable period of time, if not initially, coal gas can become less expensive than oil imports and continue to increase that advantage over the life of the plant. I think most of us who have looked at coal gasification in detail agree that this is the right combination of resources, technology, and long-term market for the country and the gas industry to capitalize on. There is a list of projects in this table, plus many new ones in the planning and study

TABLE VI B
SUPPLEMENTAL SOURCES OF GAS SUPPLY

	1980	1990 (Quads)	2000
3. LNG	0.4	1.4	2.6
• Better Than Oil Imports			
• Multiple Opportunities			
• Regulatory/Approval Process Cumbersome			
4. SNG From Liquids	0.4	0.4	0.4
• Continue Operation of Existing Plants			

LNG PROJECTS

		Country	Volume (BCF/Yr.)	Cumulative Total (BCF/Yr.)
• Operating	Distrigas	Algeria	42	—
	El Paso	Algeria	365	407
• Under Construction or Firm	Pac Indonesia	Indonesia	201	—
	Trunkline	Algeria	164	—
	Western LNG	Kenai Alaska	146	918
• Possible	(Various	Chile	84	—
	U.S.	Trinidad	219	—
	Companies)	Nigeria	584	—
		Australia	310	—
		Colombia	55	—
		U.S.S.R.	912	—
		Algeria	365	3447

TABLE VI C

SUPPLEMENTAL SOURCES OF GAS SUPPLY

	1980	(Quads) 1990	2000
5. Coal Gasification	—	0.6	3.3
• Best Way to Utilize Coal			
• 75% of United States Energy Source			
• Needs Positive Government Program			
• Capital Intensive			

POSSIBLE HIGH-BTU COAL GAS PROJECTS

		State	Volume (BCF/Yr.)
6. Commercial Projects (Active)	Great Plains*	N. Dakota	45
	El Paso	New Mexico	26
	Panhandle Eastern	Wyoming	45
	Montana Power	Montana	36
	Consolidated	Pennsylvania	—
	Tex. Eastern	Wyoming	100
	Utah Resources	Utah	100
	Washington Energy	Montana	100
	Mountain Fuel	Utah	45
	Texas Gas	Kentucky	31
• Demonstration	Conoco Slagging Gasifier	Ohio	
	COGAS	Illinois	

(*Approved by FERC; Awaiting Financing)

stages. We expect that coal gasification can contribute over half a TCF by 1990 and in excess of three TCF by the year 2000 as projects really begin to come onstream.

The next item I would like to consider is supplemental gas from new technologies. So far all the sources of gas which we have discussed are based on well proven technologies. There are several high potential gas sources which would be boosted by further research, development and demonstration. As shown in Table VI D, the first one is gas from tight formations in western sands and eastern Devonian shale. There is some substantial recovery of gas from tight formations now. The distinction made for this gas being from new technologies is that gas which requires new fracturing technology to be economically recoverable would be considered gas from new technology, whereas that which is produced now is considered conventional. This is a high potential source of gas which simply requires an extension of currently utilized technology. Next, methane from coal seams; probably at least 400 TCF of methane exists in coal seams. There are ownership questions to be resolved and some production methods and equipment which need development, but this is a potential source of new gas supplies. Gas from geopressured aquifers; the methane in the water-bearing reservoirs of high temperature and pressure, particularly found along the Gulf Coast area. You have probably seen some of these spectacular resource estimates. I have seen some as high as 80,000 TCF. Some of this gas is recoverable, but substantial technological breakthroughs are going to be required to improve the economics of recovering this gas. Gas from marine or land biomass and wastes; production will be limited by competing land uses, such as farming and certain environmental problems, and there are needs to improve collection and harvesting economics, but this may be an attractive future source of supplemental gas in certain situations. Peat gasification; it is possible to gasify peat, which is just geo-

TABLE VI D
SUPPLEMENTAL SOURCES OF GAS SUPPLY

	1980	(Quads) 1990	2000
7. Gas From New Technologies	—	0.8	3.0
• Gas From Tight Formations - Western Sands and Eastern Devonian Shale			
• Gas From Coal Seams			
• Gas From Geopressured Aquifers			
• Gas From Marine or Land Biomass and Wastes			
• Peat Gasification			

logically young coal. The processes need to be scaled up and proven. Of course, the economics of handling and gathering peat are rather poor and also need to be improved. It is difficult to make individual forecasts for gas supplies from these new technologies, but each is of such high potential that I won't attempt an estimate for any individual one but rather will make a combined estimate that we can realize around 800 BCF by 1990, and that we will have developed 3 TCF of supplies from these sources by the year 2000. Besides these, others such as perhaps gas hydrates will be feasible sources of gas by the year 2000.

Let's take a quick recap of what we have said about the contribution that alternative sources of gas supply might make (Table VII). We see that currently these categories are providing around 1 1/2 to 2 TCF and we expect that to grow around 7 by 1990, and double that to about 14 by the year 2000. If we look at how this fits in the demand gap that we discussed earlier (Table I) which we are currently filling with oil imports, we can see the supplemental gas sources can fill a very substantial part of this gap, and that gas can retain its 25 percent plus share in the total energy picture in the U.S.

TABLE VII

POTENTIAL SOURCES OF SUPPLEMENTAL GAS SUPPLY
(Quads)

	1980	1990	2000
Alaska	—	1.6	2.8
Pipeline Imports	1.2	2.1	2.0
LNG Imports	0.4	1.4	2.6
SNG - Liquids	0.4	0.4	0.4
Coal Gas	—	0.6	3.3
New Technologies	—	0.8	3.0
TOTAL	2.0	6.9	14.1

I think it is important for us to realize that none of this is guaranteed, and that all of these supply alternatives need to be developed and promoted as long-term solutions to our problems. Again, let's remember that these are mostly domestic alternatives and from the private sector. We need to work with government to promote these domestic alternatives to realize the benefits that can be available from them. I think it is the government's responsibility to see to it that a proper economic environment is fostered to promote energy solutions with long-term national and economic benefits. I think those of us in the private sector would argue that government participation needs to be as passive as possible. By passive I mean that we would favor tax policies, such as investment tax credits, rapid depreciation schedules, special tax incentives and the like. We might favor price guar-

antees, but clearly these types of incentives are favorable to the private sector over some of the other possibilities which I have seen discussed such as government-owned, company-operated (GOCO) or government-owned, government-operated (GOGO) projects. We think the government should foster the proper economic environment, and should see to it that our educational system can help bring about the personnel needed through schools and research efforts, but that the government should limit its role to those things it can reasonably do best and leave the private sector to doing those things which it can do best. That is, make projects move forward in search of economic incentives.

In that light, I think one thing that will be absolutely necessary is some mechanism to improve the speed in which we get decisions made on projects. All of us who have looked at project economics realize the severe penalty that inflation and the high cost of capital impose on the economics of a project when it is delayed. The private sector has to have some reasonable expectation that it can get fast decisions throughout the course of developing projects if we are to develop the meaningful synthetic fuels and supplemental gas projects which we need in this country. If it is not the Energy Mobilization Board, it needs to be something to guarantee that these decisions can fairly be made available on a reasonable time schedule to the private sector and to the public. Not only the certification and permit stage but the appellate needs a "fast track." It is essential.

Before I wrap up, I want to touch on one other thing that I continue to hear come up in talks about synthetic fuels development, or alternative energy development, and that is that what's developing is simply going to be a big government boondoggle for the companies. I think those of us in the energy industry will tell you that we are not interested in boondoggles. They are just not that reliable. What we are interested in is pursuing long-term strategies consistent with the needs of the country. It is just good economics. We would like to develop long-term projects that have a good future in this country and we believe that synthetic fuels production and supplemental gas production represent such opportunities.

We have resources in the East and the West that can be used. We have technologically proven means of using our energy resources in synthetic fuels production and we have the ability to advance and improve on existing technologies over time. We can produce synthetic gas for expanded use of gas in traditional markets and to replace imported oil in stationary applications. We can produce synthetic liquids from coal and shale to replace imported oil in transportation uses. Barring any major economic disruptions or wars, our credit and capital markets should be able to supply the dollars required for energy development. A recent study by Bankers Trust shows that supplying the capital for expansion of domestic energy supplies to a point which will accommodate growth from 77 to about 90 Quads and lower oil imports to below 6 MMB/D by 1990 will be a manageable task. It

TABLE VIII

GAS OUTLOOK SUMMARY
(Quadrillion BTU Unless Noted)

	1980	1990	2000
Total U.S. Energy Demand	77	90	105
U.S. Domestic Conventional Energy	59	69	81
SHORTFALL	18	21	24
Supplemental Gas	2	7	14
Supplemental Gas as % Shortfall	11%	33%	58%
TOTAL GAS SUPPLY:			
Conventional	19	16	13
Supplemental	2	7	14
	21	23	27
Supplemental Gas as % Total Gas	10%	30%	52%
Gas as % Total Energy Demand	27%	26%	26%

is important for the government not to be a heavy deficit spender, requiring huge amounts of borrowed funds, crowding out and raising costs of private sector borrowing to insure that this task can be done. The only thing the government has to do to see to it that the private sector does its part is give clear signals on what the rules of the game are going to be and to foster a good economic environment to permit development of these resources. I think I can speak for the private sector in saying that we expect to do our part and we expect to speak out and let public policymakers know what we expect from them if all of us are to realize our energy independence. Developing a major synthetic fuels industry is America's answer to the energy crisis.

PANEL DISCUSSION



DR. LEE: In moving towards a synfuels industry, I think you have heard some very positive thoughts expressed here today by the representatives of the private and the government sectors. In this very informal discussion, I will throw out a couple of questions each way to see if we can add a little more to the topic that we have discussed this morning.

Ruth, I'll start with you. In getting a synfuels industry going and with the shift in administration and mood in the country, how do you see the future of synthetic fuels? In particular, how do you feel the Synthetic Fuels Corporation and other incentives the government might provide to stimulate this industry might go forward in both the commercializing or, as you prefer, the industrializing, of processes and in demonstrating technologies?

DR. DAVIS: I have already provided a caveat to my comments by simply saying that what any of us can say about the future is conjecture at this point. Let me make a few comments with that very broad caveat in your minds.

In dealing with Congress and with industry, there hasn't seemed to me to be a divergence of opinion relative to the need for getting a domestic fuel industry in place. I have not seen that divergence between the Republicans and Democrats or between different parts of industry. What exists in terms of difference

of opinion is how to get that synthetic fuel industry in place. The how, as seen overall by the private sector, usually revolves around the amount of participation by the government and the manner in which the government participates. It's my feeling that getting an industry on line as opposed to dotting the landscape with R&D plants is really a function of the private sector. It has never been done in this country by the government. Maybe the government could do it but why try when the industry has done it in the past? It's also my belief that the Synthetic Fuels Corporation exists at the moment because of a perceived need for funding of the private sector and a lack of available capital in the private sector for energy industry development.

I'm not sure that that perceived need can be stated in simplistic terms. In terms of overall investment that's available in the private sector, we have \$2.5 billion or so a year that's available from the investment community. That doesn't build half of a good-sized shale oil plant but you don't need to build half of a good-sized shale oil plant in one year either. One area that we all need to give more attention to is whether there is available in the private sector enough capital to get a synthetic fuel industry on line? I would conjecture that the answer is "no" if you want to involve small businesses and middle-sized businesses. Not only would I conjecture but I think it is a fact that there is not that kind of capital investment available to companies of that ilk. If you want to have the development financed by the big companies and industries, then I would conjecture again that it can be done and it can be done as fast that way, perhaps even faster, than with government involvement.

I see that the Synthetic Fuels Corporation will have as a major task determining the kinds of companies as well as the kinds of energy to which it must provide its capital for investment purposes. The extent to which industry heaves to and builds an energy industry, I think, depends upon their perception of another role of government and that is removing the environmental and regulatory constraints to normal marketplace activities that industry is accustomed to. I don't know whether they can be removed or not. There is a very strong environmentalist movement in this country and there will remain one. We all want to protect our environment. There is a difference between that and having too many regulations.

I also think we have to highlight two syndromes. The need for government to provide the proper economic environment is a difficult thing to do. It means overcoming two basic tenets of our country at this moment. One is antitechnology and the other is antibusiness. And until technology, industry and government, the three of us together, can find a way to have the world recognize and have our public recognize that an attribute essential to our country is one of a strong industrial base and a strong technological community then I don't think that government will be able to produce the economic environment that industry needs.

DR. LEE: Thank you, Ruth. Jack, I know you stressed incentives very strongly in your talk whether they be financial incentives, direct or indirect, fast track legislation, or some mechanism to speed up things. How do you look ahead to the future years with this new atmosphere and in light of what Ruth just said about what industry might need most as incentives to get things going?

MR. BOWEN: I certainly think that the Synthetic Fuels Corporation is a very desirable piece of machinery in Washington and it should be retained. You know, we think money is going to be available from the conventional sources -- the commercial banks, the big financial institutions. But the people that lend money are very conservative and careful as they should be. When you go to the financial marketplace with one of these big, new, first-of-a-kind synthetic energy plants and say "Look, I want to borrow \$1.5 billion, \$2 billion," a banker is very glad to do business with you but he says "I'll be glad to lend you this money but show me one just like it that is working." And you say, "Well, my engineers say this thing is going to work." He says, "I understand that but show me one."

So, until you get one working that you can take him to and say "We're going to duplicate this." he's going to be very cautious. He's going to want the company that's going to build it to use its credit to guarantee that loan. And for even large companies, not just little ones, such a large amount of credit guarantee would tie up so much of their financial capacity for a relatively small amount of energy, that most of them are unable to do it.

I know, speaking for my own company, if we were to guarantee a billion dollars worth of debt or a half billion dollars worth of debt just to produce something like 100 million cubic feet of gas per day, it would use too much of our credit. It would prevent us from doing other things that we need to do to maintain our gas supply. So, in these first-of-a-kind plants where some financial support is needed, and only to the extent that it is needed, I think the government has a real role to play.

Now, if we had plenty of time, I'll agree that that the free market system will eventually take care of these things. But time is our enemy. We do not have any time left. We can't wait 20 or 30 years for the free enterprise system to develop these new synthetic plants. We're 10 years late now in developing commercial-size synthetic plants using coal and shale. We ought to be building tens of them today to convert our energy resources into more available forms of energy. So I strongly support the retention of the Synthetic Fuels Corporation.

Talking about the environmental aspects and the problems there, I've always said, "Look, we're not trying to take away anything that's been gained." I love the environment as much as anybody. Much progress has been made and nearly all of it has been justified. But, what I say is this, "We're not trying to

turn back any of the environmental records or the things that have been gained over the past 10 or 20 years. We're just saying that everyone is going to have to talk much faster so that decisions can be reached promptly."

We're going to go through the obstacle courses but we're going to have a fast track doing it. You're not going to give up anything, but no one individual or small group, well-meaning or not, is going to be able to delay a large project. They're going to have to come in and defeat it or not on the merits. I think the private sector is perfectly prepared to take that risk because we think we can win on the merits. If we don't win on the merits - so be it.

I've had environmental lawyers say to me, "We can kill any project you come up with through delay. If we don't get you in the regulatory arena we'll delay you so long in the courthouse that your project will die of old age and all your numbers will get stale." And, by gosh, unfortunately, they're just about right. So I say that it is essential that this new Congress, get on with it and get us some fast track legislation or none of the synthetic fuels industry will really get started in any meaningful way.

Another thing that has to be done by the energy industry and by our leaders in Washington, is to really tell the American people what the story is. I heard a report the other day, a poll, that over 65 percent of the American people still believe that the energy shortage is make-believe, that it is contrived by the major oil companies. The American people have got to be told that the energy shortage is real, that it's a shortage of available energy but not energy resources. Once they recognize that, then I think the message will get to Washington that we should solve our problem ourselves and quit worrying about OPEC oil. And I think that has to be done right away. It's high time that the American people know and understand the true nature of our energy problem, which is really, I think, the most serious problem our country has faced perhaps forever. It's a problem that has all the ingredients necessary to really destroy our country if we don't get it solved real soon. (Applause)

DR. LEE: Thank you, Jack. I think we have time for a couple of short questions because Dr. Davis does have to catch a plane. So, let me fire one quick question to each of you and then we'll adjourn.

You have expressed in your comments concerns for a broad variety of energy forms, renewables and other sources. How do you see these fitted into the picture along with synthetics?

DR. DAVIS: The United States is lucky. It has more energy options than most countries in the world. It doesn't have the luxury of not exploiting all of those energy options. The dimensions that one has to take into account in exploiting these

energy options are time, quantity, availability and cost.

It seems apparent to me that in terms of time and the spectrum between the kind of energy forms we're using now and the ultimate ones which are generally depicted as being solar or fusion, there is a very important time frame in which we have to stay alive as a country. In that time frame, which started in 1975 and will go through at least the year 2010, the principal sources of energy that we have available to us on a controllable basis other than nuclear are those that are derived from coal, shale oil, peat and lignite and are what we call the synthetic fuels. Looked at in that way, the synthetic fuels not only have a reason for existence on their own but are absolutely essential to keep us alive until we can develop those forms which are much more benign and more environmentally tolerant such as solar and fusion. We all would like that. The development of a synthetic fuel industry and the use of those feedstocks is the key to our survival until we can get the kinds of energy that we'd all like to have.

DR. LEE: Okay, let me take the other side of the spectrum -- long-term. You spoke about conventional gas production. Obviously, it is a thing of today and synthetic fuels are coming. Would you like to make any wrap-up on conventional production relative to synfuels?

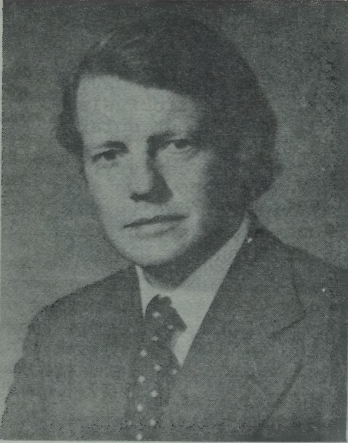
MR. BOWEN: Well, you hear a lot of talk about if we just do this or that we'll get our conventional oil and gas production up. We've looked at it long and hard and we just don't see any way that the production of conventional oil and gas in this country is going to increase. It's going to decrease over the years to come and I think most everyone that looks at it comes up with that same answer. I think that's got to be built into any study of the future...that there is still as much oil and gas to be found in this country as we've found in the past but it is harder to find, it's coming in smaller pieces, you have to drill deeper to get it.

Just look at the record in the gas industry. For 10 years we have not been finding as much as we have been producing and we don't expect that to change. It's going to improve but it's not going to switch over. So, while we have a temporary surplus of gas available in the country right now based on deliverability, it certainly is not based on increased reserves. One thing I'd like to point out, A.G.A. has just come out with their study called "The Gas Energy Supply Outlook, 1980 to the Year 2000." Many of you in this room probably had something to do with that study. I strongly recommend it to you and the people you talk to because it presents a very positive picture for methane or gas energy over the next 20 years. And it is a picture that shows and, I think, proves realistically that with all of these options we have, we can increase in absolute numbers the amount of methane this country has, even though the conventional production of it is going down.

We have a very positive picture for the gas industry. The best part of the whole energy spectrum is methane and it looks to me like it's going to stay that way from a supply standpoint and a cost standpoint well into the year 2000. The point Dr. Davis was talking about, the essential nature of the synthetic fuels industry, is on us right now. We all love to talk about solar, we love to talk about hydrogen, we love to talk about all these exotic forms of energy but that's really in the next century. Somehow we've got to survive to 1990 and the year 2000. We just cannot flip a switch and end up in the 21st Century. We've got to get over the next 5, 10 or 15 years and those are the crucial years. We're going to need more energy to do it and it has got to come from domestic sources. We're certainly not going to increase OPEC energy.

DR. LEE: I think that very well summarizes the whole picture from all angles. Synthetic fuel is needed today. Call it the bridging fuel, call it the fuel that we have to rely on, call it the fuel that we must have to make use of the large amount of energy resource that we still have untapped in this country. This has got to be the fuel that will carry us for the next 20, 30, even 50 years before the long-term solutions of energy supply can be upon us. If we all feel likewise, let's get on with the job and go out and do our share in getting this industry launched.

Thank you all very much for being with us today and as the lights come on we'll adjourn. Thank you again. (Applause)



Charles B. Curtis
Chairman
Federal Energy Regulatory
Commission*

SOME FUEL FOR THOUGHT ON SYNFUELS

Last summer the outgoing Congress and the outgoing President agreed to legislation that makes a massive Federal commitment to the development of a synthetic fuels industry.

One gathers from the public prints that the President-elect and his advisors may re-examine that commitment. It is perfectly appropriate that they should. The statute in question, the Energy Security Act of 1980, contemplates the expenditure of enormous sums. It presents public policy questions of considerable regional and national significance. And we are speaking of a law passed a mere few months ago. The program awaits implementation; it is still an infant.

Hence, the new Administration and the new Congress may well wish to take a fresh look and reassess the balance of costs and benefits entailed in rearing this industry to maturity. If they do so, I am reasonably confident that this reassessment will lead to a reaffirmation of last summer's commitment. The commitment is likely to be scaled down but it will be a commitment of considerable size nonetheless -- probably in the \$20-\$30 billion range.

*Resigned December 31, 1980.

When I say that, I am by no means unmindful of all that can be said -- and said persuasively and cogently -- against this program. It seems at first blush to involve a massive return to the dubious notion that Government can solve problems by throwing lots of tax money at them. And the program also entails governmental intervention into the marketplace of a kind that evokes basic objections from many all over the ideological spectrum.

Nevertheless, I believe that the decision to go forward with a major governmental program for synthetic fuels development -- one heavily laced with subsidy -- will be made anew. The reaffirmation of this commitment will be made simply because the awesome dimension of the energy plight confronting this nation commands it.

Much has been said and much written about the seriousness of the situation. So there are many from whom I could quote. The person I choose to quote is Mr. Felix Rohatyn of the investment banking firm of Lazard Freres. I think he has summed the matter in a few, very forceful words.

In a thought-provoking essay that can be found in the current issue of The New York Review of Books Mr. Rohatyn notes, among other things:

"At the current rate of imports, before price rises that inevitably will result from the Iran-Iraq war, we will, during the next five years, pay over to OPEC approximately half the market value of all companies listed on the New York Stock Exchange. This means that we soon will be turning over the equivalent of half our productive capital built up over the last 200 years for a product we burn every day. Even the lure of huge contracts with the OPEC nations, or the attraction of their large deposits of money in the U.S., should not blind us to the economic and political power transferred from the West as well as its inflationary impact. Recycling is a myth; it only means lending more and more to people in third world countries who can afford it less and less."¹

In the usual analysis of our dependency, we are confronted with measures of the situation which are expressed in terms of percentages or quantities of our oil import requirements. These figures are indeed impressive. But I would hazard the view that we have become so accustomed to speaking in these terms we have lost sight of their implications. Mr. Rohatyn's statement appeals to me because he has found a way to dramatically show us just how massive is the drain of this nation's wealth which attends our continued dependency on OPEC.

¹Rohatyn, "The Coming Emergency and What Can Be Done About It," The New York Review of Books, November 4, 1980, page 20 at 22-23.

I am convinced that we will solve the economic and technological barriers to synfuels development. I am less sanguine that we have yet developed the means to deal effectively with the sociological, political, and legal impediments to large scale deployment of proven and economical technologies.

A moment ago I cited the Book of Proverbs. I suggest that we can also find wisdom pertinent to our present needs in the thought of a twentieth-century lawgiver who was steeped in the biblical tradition. That was Mr. Justice Brandeis who advised: "If we would guide by the light of reason, we must let our minds be bold."

Once upon a time vast projects could be brought into being by simply marrying large sums of money to adequate technologies. That time is past. For good or ill (opinions differ about that), we have developed a culture in which a deep pocket coupled with the right kind of know-how and with the will to achieve can still prove vain, fruitless, and barren.

The last 20 years have seen what some call a "litigation epidemic" and others style a "due process explosion." Procedural developments in what we lawyers call the concept of "standing" have made access to the courts and to administrative tribunals much easier than it used to be. Those who want to keep things the way they are, and to block projects that they deem objectionable, have the resources, the skills, and the drive to use these devices effectively and skillfully. And the environmental movement has given those people new substantive legal tools. It has also sharpened old ones that stem from venerable common law conceptions about rights to water and to air and from doctrines about what the courts call "nuisances."

As a result, the legal system has tilted sharply toward the negative. It has become much easier to stop proposed electric power plants, oil refineries, and pipelines dead in their tracks than it is to move them forward. It is hard to see how our refinery capacity, our great oil and natural gas pipeline networks, and our railroad system (as it was in its prime) could ever have been brought into being, had their creators been confronted by anything resembling the legal situation of today.

But that is the legal environment with which the synfuels industry must cope. How well it copes in this arena will determine the future of this industry. And, as I have said, the country has a lot riding on the outcome of this test.

Indeed, I believe that this industry will be shaped not so much by the results achieved in the laboratories of the Institute of Gas Technology or the oil and gas industry but by the results obtained in the social laboratories of local, state and Federal government and our courts.

And we have to face another and an even more important fact, which is that nowhere else in the world has exploratory and drilling activity been as prolonged and as intensive as it has been here. This means that it would be the sheerest folly to rely on an infinite series of dramatic new domestic discoveries to return us to energy independence.

There is some evidence to support a more favorable view of domestic gas prospects. Nevertheless, there is no reason to believe that the fundamentals in gas differ materially from the fundamentals in oil. So total laissez faire in energy will not release us from the bonds of import dependency.

In this connection, one must always remember that some of the most important foreign producers on whom we depend are thinly populated, well-positioned to sacrifice present income for future income, and therefore able to curtail production (out of long-run economic self-interest as well as for political reasons). They can -- they have -- and strategic planners must assume they will in the future.

All of these factors lead to the conclusion that it is in our national interests to develop a synthetic fuels industry. But are large commitments of the public purse really necessary?

It is easy to say that if synthetic fuels make any real economic sense, profit-seeking entrepreneurs will develop them in the same way that they developed so extraordinarily capital-intensive an industry as electric power, in the same way that they developed natural gas, and in the same way that they developed oil itself. This line of reasoning can, of course, be found in any elementary textbook on the principles of economics.

In first year economics we are taught that the purpose of business is to make a profit and that high profits attract new entrants. If there is lots of money to be made in ink or in screws, capital will flow into those pursuits and into the exploitation of new techniques capable of producing substitutes for those commodities.

Now that petroleum and natural gas have become expensive, oil shale and coal gasification should be capable of fending for themselves in the marketplace. The trouble with this approach is that it relies on valid propositions about markets in general -- propositions that do not fit the extremely peculiar concrete case presented by the energy market of today or the energy market of the foreseeable future. That market is dominated by a cartel of nation-states that has the power to set the price of oil at levels high enough to maximize long-run revenues but nevertheless low enough to choke off competition from substitutes.

That overwhelming market power is one of the specters that has haunted synthetic fuels development. Those who must assess the economics of a technology believed to be capable of competing

with oil, if oil is at X dollars a barrel, have to face the fact that oil may not go to X dollars a barrel soon enough to validate their investment or that if it does get there, its price may be cut back just in time to nip their venture in the bud. That risk is superimposed on others flowing from the imponderables involved in the commercialization of novel technologies, from the long lead times required, and from the sheer magnitude of the investments required. So, from a pure marketplace perspective, the balance of costs and benefits is either unalluring or not alluring enough to elicit large-scale investment.

From a public interest perspective, however, new terms enter into the equation, terms that a private sector decision-maker is precluded from taking into account at their true social value.

Among those terms are the balance of payments and national security considerations on which I have already touched. Their magnitude and their gravity invalidate an either/or thinking about energy. Debates about the relative merits of conservation versus production and of an intensified domestic search for conventional oil and gas versus synfuels confuse rather than enlighten. The problem is so acute and the need for action so pressing that we need all of these things. We need to exploit our conventional domestic energy resources to the fullest. But we also need to supplement those resources in new ways, even if those new ways lack short-run economic promise.

It is this need to look beyond the short run which mandates a prominent and an active role for Government. However affluent and however far-sighted some of them may be, private enterprises are necessarily constrained by relatively short-run considerations. Business must focus primarily on tomorrow's bottom line, on what the Standard and Poor and Moody services are likely to think, and on legal duties to shareholders and creditors. Investors are much more interested in what they can get in 1981 than in what their decisions in that year can do for the Republic in, say, 2001. So are lenders. Thus, the business community cannot afford to look too far beyond the horizon.

But society can, should, and must look at time horizons too distant for the unassisted private sector.

Time horizons are not the only respect in which societal calculations differ from those that people can afford to make in managing their own affairs and their own assets.

Society, which is all of us collectively, can and at times must take bigger risks than those that any of its members can afford to run for his or her own account. There are circumstances (and the energy crisis is such a circumstance) in which what would be folly for a business is good judgment for Government. Thus, at this juncture, prudent businessmen and bankers are not likely to be able to afford to bet much on the chance that a large scale synfuel program may yield really significant

technological breakthroughs that usher in a whole new era in energy far sooner and at far less cost than all, save a handful of visionaries, now consider likely. As a nation, however, we can afford to place that bet. I would go further. I would say that the nation cannot afford to refuse to make that bet, recognizing full well that is by no means a sure thing -- and indeed something of a long shot.

Earlier in our history a nation firmly wedded to private enterprise and guided for the most part by the Jeffersonian axiom that that government is best which governs least nevertheless made a very large (by the standards of those days an almost unbelievably large) societal commitment to railroad construction. The railroads were not built by unaided private enterprise. When state assistance proved insufficient, Washington came to the rescue. And it did so on a most munificent scale.

Of course, that decision had its minuses. It spawned a great deal of corruption. It led to much construction that hindsight showed to be wasteful and uneconomic. Indeed, some recent writers on our economic history suggest that the whole thing may have been a big mistake.

But they have the luxury of speculating about these matters at their leisure in libraries lit by hindsight, which has been described as "always better than foresight by a damned sight." And theirs is very much a minority view. Most Americans of that day were very glad indeed to have the railroads -- and to have them sooner rather than later. Neither in this country nor in other countries was it thought wise to leave the fate of the Iron Horse to pure marketplace calculations.

I trust that the analogy is as plain and as compelling to you as it is to me.

Some 2500 years ago King Solomon said: "Where there is no vision the people perish."

In looking to the development of a synthetic fuels industry we are looking to the future and attempting to bring that vision into focus in the present. There are substantial risks involved -- risks which society as a whole will have to bear. Mistakes will be made -- we must expect that. Money will be lost in failed ventures -- we must expect that as well. Corruption may seep into the program -- this too we must expect and have the temerity to proceed nonetheless.

I think by now you all have gathered that I am a strong advocate of a governmentally assisted synthetic fuels industry -- and that I remain bullish about the prospects of the fledgling Synthetic Fuels Corporation.

I want to conclude, however, by sounding a note of caution for I feel duty bound to call attention to a substantial cloud on the horizon.

The excerpt I have just read focuses on the economic consequences of our state of energy dependence. But as dark as are those skies, even more foreboding in my view, are the national security implications of the current state of things. Modern warfare is energy-intensive; so are modern peace-keeping activities.

That was obvious even in World War I. David Lloyd George, who would seem to have been fairly well informed about that struggle, said of World War I that "The Allies floated to victory on a sea of oil." That was even clearer in World War II. In those days, however, the United States was a great exporter of oil. Nevertheless, there were heatless days and curtailment programs in 1917 and 1918. And during the second great struggle both gasoline and heating oil were tightly rationed.

How is our nation likely to fare when it is a great importer of oil, even in peacetime?

Will an unbridled market function to free us from these consequences? Will it do so in time? Can we rationally wager our national security and our economic health on the market response?

I think not. Time has become our enemy. And because of this, we no longer have the luxury to rely on the pace and the uncertain outcome of the marketplace.

Before I proceed further, however, some ground work should be established.

Since I am here in Chicago, not too far from the academic seat of the free market faith down on the Midway, this is a good time and a good place to say that:

1. I believe in free markets;
2. It seems clear to me that regulatory schemes that were well-intentioned but sometimes poorly reasoned and maladroitly administered contributed substantially to the energy mess in which we find ourselves; and
3. A greatly enhanced measure of reliance on market forces is indispensable to a sound energy policy.

Reliance on the market is an indispensable part of a national energy program. But the part is not to be confused with the whole.

Throughout our deliberations on energy policy we have not been able to escape from a simple, unavoidable and dominant reality. When we deal with oil and gas, we deal with resources that are finite and non-renewable. The United States may be God's Country. We like to think it is. But we have to face the unpleasant fact that He gave it no exemption from that law of nature.

You see, I have confidence in your finding solutions. My confidence in government and our legal system is less secure. Problems will be encountered in great abundance. Today's problems are not the same as those in 1932. But the counsel that Brandeis gave the America of that difficult time is as valid today as it was when he wrote: "We must let our minds be bold."

Without some machinery for cutting through the legal thickets in which its projects are bound to become enmeshed, I do not see how the Synthetic Fuels Corporation can live up to its potential. It seems readily apparent to me that, even assuming all economic and technical barriers are removed, a synthetic fuels industry cannot be and will not be deployed if hobbled by a juridical order that is "all anchor and no sail." One hopes, therefore, that our lawmakers at both the Federal and state level will recognize this urgent need and devise decision-making mechanisms capable of balancing the significant social interests as well as the legitimate private interests that the objectors will invoke against greatly augmented domestic energy production. And, of course, these mechanisms must be capable of striking that balance rationally, humanely -- and above all, expeditiously.

Our nation's future as well as the future of the industry depends on the success of their efforts.

OPENING REMARKS

Mr. LEE. Thank you very much, Mr. Chairman, and members of the committee.

For the record I want to say I am Bernard S. Lee of IGT and I have appeared before this committee on several occasions. I am pleased to be back.

Before I get into the testimony I thought it might be of interest to note that I just came back last night from a long trip around the world visiting with a number of oil ministers and I am still in a terrible jet lag. I felt some of the comments made while discussing this energy matter of the National Oil and Gas Corporation are appropriate for what I have to say.

Three things struck home. One, it is very clear that the world oil price has gone up. The number that they gave me was \$100 a barrel by 1985. I personally said I don't disagree when the world is doing a lot in conservation. The answer comes back. What are you doing for alternative supplies? We have not seen any. The producing countries are planning to reduce their production, if anything, to stretch out their resource for a longer term so I think the world will stay in the limited future of oil supply.

The second point was that among these oil producing countries they are all looking ahead to developing their own alternative energy sources. I have had discussion with all of them in developing their coal, their oil shale, their peat. Many of the smaller importing oil countries are expecting to become oil exporters at the turn of the century and they are very concerned.

Third, they look with a great deal of interest in what the Americans are doing in their energy development and the one error that is most significant to them is our effort on synthetic fuels. All the questions they addressed to me were what are our programs on coal and shale development, and what our projected cost and timetable will be.

It is one thing to conduct R&D, which I have done and my people have done, but I think it is another thing to produce these in the marketplace. The institutional and regulatory barriers which we have to face in this country are very great to the people outside. Until we develop the broad based alternatives, caps if you will, the producing countries in the world just feel that we have no alternative except to purchase whatever is required. Therefore, I feel that the development of indigenous alternative energy supplies is every bit as important to us, every bit as critical to us as a sound defense posture. I think we need all the action and all the support we can get from Congress in carrying through the whole chain of development from laboratory R&D in order for us to have energy supplies in place.

I have testified before this committee and others on the so-called real cost of oil import and I heard other witnesses testifying that the real cost of oil imports is much greater; we estimate three times greater than the physical cost of a barrel of oil. Also, as I testified before, how we should go about deploying this whole spectrum. The long lead time that is required to get these things in place, whatever we say today in less than ten years could not possibly be accomplished.

As to decontrol of oil prices, the additional production that I see out of this to me is going to be detrimental so that we need to work

on the supply side, expand our supply base. In that spirit I will briefly comment on a number of R&D programs that we at IGT had been conducting on the whole spectrum of coal and oil shale.

The first one is the Memphis Industrial Fuel Gas Demonstration Plant program. I understand that Mr. Hansen, the President of Memphis Gas, will be testifying this afternoon so I will not dwell on that except to say we are fully supportive of Mr. Hansen's position. It is important to have the program carry through in a truly commercial demonstration sense with the marketer, with a buyer and with the great deal of potential we are using.

The second area I would like to address is the area of gasification, the conversion of peat to synthetic fuels. As an R&D organization we are probably the only ones right now doing any significant work in this area. We appreciate the support of the committee in the past three years. The program is going well. We received a lot of encouragement and support from the Europeans who are working on peat in the Scandinavian countries in particular because they have peat, Ireland has peat and many countries have peat. We have a tremendous amount of peat resource which needs to be developed.

The program is at a stage where we are in the middle of modifying an existing government-owned pilot plant operation to test that and we will act to complete a test program in 1981 and 1982. If money changes, you don't know the details of that. If we do not modify our program, then we expect to start the testing of the peat program in the pilot plant in this fiscal year and complete that in 1982. We would like to ask the committee's support to allow us to finish that program and make this important resource available to the Nation.

HYGAS

The third item is an interesting issue. Last year Congress appropriated \$5 million to do a Phase Zero study of a gas and coal process called HYGAS and that is the last step in the fuel development chain. It will be complete after we transfer it. That budget now I understand has been put in a deferral position by President Reagan's team and we would like to commend this program to the committee with support that the work ought to go ahead with the \$5 million and when the whole R&D chain will be complete.

Mr. LOEFFLER. Could the private sector produce these funds? We are almost at the point of turning it loose for commercialization. It would seem to me that would be an area that would be of extreme interest.

Mr. LEE. Yes, Mr. Chairman. In the private sector the Gas Research Institute has put up with the government, on a one-third/two-thirds basis for a number of years, to develop this technology. It is at a size where we have to get into a specific stage and a number of States—Illinois, Kentucky and other States—have expressed great interest in bituminous coal for this technology. I think after we do the space zero design that will become possible by the private sector. The companies were working to keep the consortium going but until we do that we would have a missing gap between the R&D part and the first step towards commercialization.

One area I will mention just to express our appreciation to the committee, not looking for any funding this year, it has been

worked on in eastern oil shale which this committee has supported for a number of years and we are pleased with that. I would just like to let you know that is the case.

Finally, very quickly, two areas. Fuel Cells, IGT has been doing this a little bit different. There is a contract with DOE. All we seek is a full funding of that as indicated in the contract.

I know the time is short.

Solar energy we are all working on but we hope that will be a part of the effort.

I thank you for the time.

SOLAR TECHNOLOGY ADVANCEMENT

Mr. LOEFFLER. May I ask a question of particular interest? My district has a lot of solar energy activities. What is the advancement of solar technology? Until we actually are able to harness solar rays and convert it into usable energy what are we currently producing other than just sunburn?

Mr. LEE. As you well know, the program is moving along and it is moving into the commercial sector. One is in producing electricity through advanced multiple systems. That is going on; we are doing some work in that. We are moving into one more area taking solar energy and converting it directly to chemicals, ammonia, hydrogen and methane oil. We think that becomes usable but not storable. That is on a small scale R&D program long-term and at this time not ready for commercial operation. Until you have the support to get this technology moving and passing through the various stages 10 years from now, you are going to have the solar ready as you all know. So we are very active in this area.

Biomass in the Gulf Coast area, with the sunshine and all offshore, we are very much interested in that and doing significant work on that but that is ten, twenty years down the road. It is not going to happen tomorrow, Mr. Chairman, but it is necessary.

Mr. LOEFFLER. Mr. McDade.

Mr. McDADE. No questions.

Mr. LOEFFLER. Thank you.

Mr. LEE. Thank you very much.

GEORGETOWN UNIVERSITY

DOE—FLUIDIZED BED COMBUSTION-FOSSIL ENERGY

WITNESS

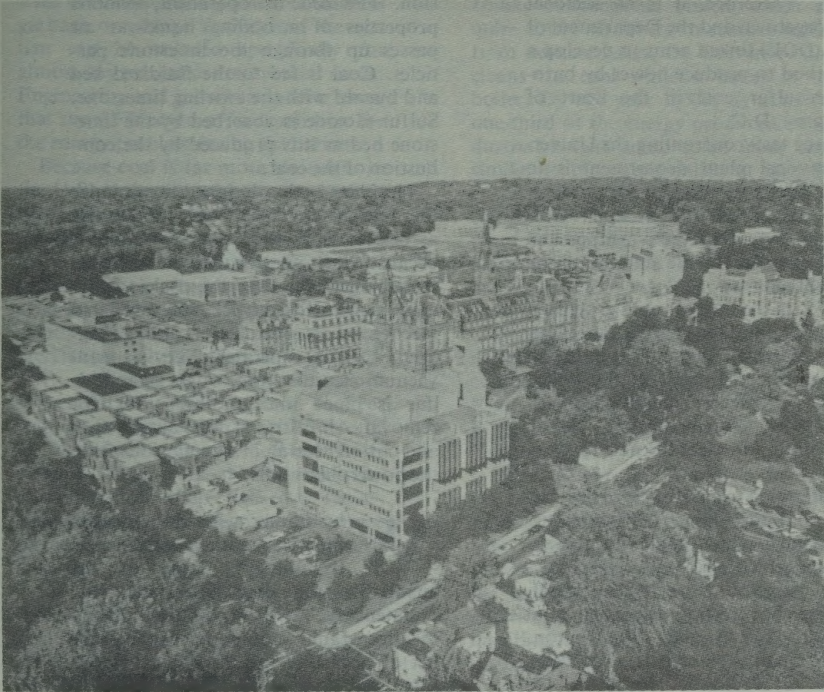
FATHER WILLIAM L. GEORGE, S.J., SPECIAL ASSISTANT TO THE PRESIDENT OF GEORGETOWN UNIVERSITY

Mr. LOEFFLER. Georgetown University, Father William George. Without objection, your statement will be made part of the record.

Father GEORGE. Thank you, Mr. Chairman.

[Material follows:]

Georgetown's Coal Fired Fluidized Bed Steam Generation System



GEORGETOWN UNIVERSITY, Washington, D.C.

Georgetown University has a sprinkling of ivy-covered halls and is steeped in tradition that dates back to a time when cows grazed where the nation's capitol now stands, yet is also wedded to the future through the pursuit of new ideas and innovative thinking. Therefore, it is no accident that Georgetown and the Department of Energy (DOE) linked arms to develop a new method to produce power by burning high-sulfur coal in the heart of Washington, D.C.

A major task confronting the University's physical plant department is to heat and cool a complex of 51 buildings with a total of 2.2 million square feet spread out over a 101-acre campus and hospital complex in the middle of the metropolitan area.

In 1975, in the face of rapid growth, it was decided the University's two existing oil and gas-fired boilers would not meet the projected needs of the 1980's and 1990's. However, emerging technology provided the institution with a usable solution to meet the new requirements.

The emerging technology was the "atmospheric fluidized bed (AFB) combustion system," which could burn high-sulfur coal which is abundant. The powerplant, designed to be relatively pollution-free by meeting Environmental Protection Agency and Washington, D.C. air quality standards, was dedicated at Georgetown, November 15, 1979. It became the first commercial-sized powerplant of its type in the nation.

Designed for easy operation and low maintenance, it operates on the fluid-bed principle in which granular particles of limestone are supported by a flat plate with nozzles through which air is pushed with sufficient velocity to lift and maintain the particles in suspension. The bed, in operation, exhibits properties of a boiling liquid as air passes up through the limestone particles. Coal is fed to the fluidized bed and burned with the swirling limestone. Sulfur dioxide is absorbed by the limestone bed as it is produced by the combustion of the coal.

The plant is also designed to minimize the release of dust, odor, and noise associated with traditional powerplants because the materials are in a closed system from the time the coal is delivered in an enclosed truck, run through a mechanical dust collector and a bag-house which operates like a giant vacuum cleaner, and to when the residue is piped into another truck for removal. All of this is done out-of-sight and out-of-hearing of anyone not within the powerplant walls.

Why bother with the development of an expensive, new technology? Some of the answer is the easy operation, low maintenance, and low pollution already mentioned, but another part is the product of two converging elements of our time.

The first element is the realization that high-sulfur coal reserves have been estimated by some officials to be sufficient to meet our energy needs for 200 to 300 years. The second is the need of alternative energy sources for tens of thousands of institutions (including

5,000 higher education and 7,000 medical establishments) faced with the necessity of converting to coal from oil and gas because of curtailment or unavailability of supplies.

The AFB can use any one of a given number of types of fuels depending on what is available in a given area (such as garbage or sewage sludge) and the system can be tailored specifically for almost any private or commercial needs. Engineering and economic studies show that the AFB could offer a solution for the energy problem facing the nation.

Because coal is far more abundant in the U.S. than oil and natural gas, it is being counted on to replace increasing amounts of high-cost imports and to help minimize the impact of the expected decline in world oil production after the 1980's. Coal, however, is by no means assured of fully acceptable commercial use. The problem is that coal is dirty. Although coal constitutes about 90 percent of America's fossil fuel resources, it supplies less than 20 percent of the nation's energy. Locked in its chemical latticework are numerous impurities which, when released to the atmosphere or deposited on the land, pose serious environmental and health hazards.

Eastern coal, which represents nearly three-fourths of the country's annual coal production, is typically high in sulfur content. Under the 1977 Clean Air Act amendments, all eastern coal will require some form of sulfur removal. Almost 90 percent of the nation's coal cannot meet the existing environmental standards unless costly and sometimes unreliable flue gas desulfurization equipment, or "scrubbers" are added.

If direct coal burning is to become an increasingly important supplier of energy, its environmental obstacles must be overcome. The DOE's highest supply priority, therefore, is to develop

ways of burning coal more cleanly with less environmental risk and at affordable costs.

The AFB boiler at Georgetown will be a significant demonstration that the nation can replace many oil-fired boilers with units that burn sulfur coal cleanly. Unlike conventional boilers which require costly scrubbers to remove sulfur from exhaust gases, the University unit cleans the coal while it burns in the boiler. By the year 2,000, as much as one-third of the energy produced by industrial boilers could come from units similar to the one installed at GU, according to DOE technology commercialization studies. The Georgetown plant is the first in service of eight authorized in 1976 for construction around the U.S. to illustrate this new energy system.

Georgetown and DOE called on two of the pioneers in the field of fluidized combustion of coal in the U.S. — Pope, Evans and Robbins of New York and Foster-Wheeler Corporation of Livingston, N.J.

Pope, Evans and Robbins, involved in AFB technology since the early 1960's, was named the architect engineer for the plant and provided construction management services during the building stage. Foster-Wheeler, in addition to designing, fabricating, and installing the new boiler, supervised start-up operations.

Designed and built by the four-member consortium, the powerplant was finished in three years and was first fired off July 9, 1979. A "national exemplar" — in government parlance — the powerplant has already brought many visitors to Georgetown University from as far away as the United Kingdom, Germany, Brazil, and even the People's Republic of China.

Early visitors were predominantly from the industrialized states with large coal reserves and engineers from energy

conscious companies, as well as government and environmental representatives. The plant, designed with a visitor center, is planned to increase the knowledge of thousands more visitors during the coming years, visitors who could help us save the U.S. millions of barrels of oil each year as they take information on the new technology home with them.

"If successful in meeting its goals, the plant will have tremendous commercial application at similar institutions," explained Ben Scarbrough, GU's program manager and director of construction. "We are confident that a successful demonstration plant at Georgetown will advance the use of coal at similar physical plants by at least 10 years."

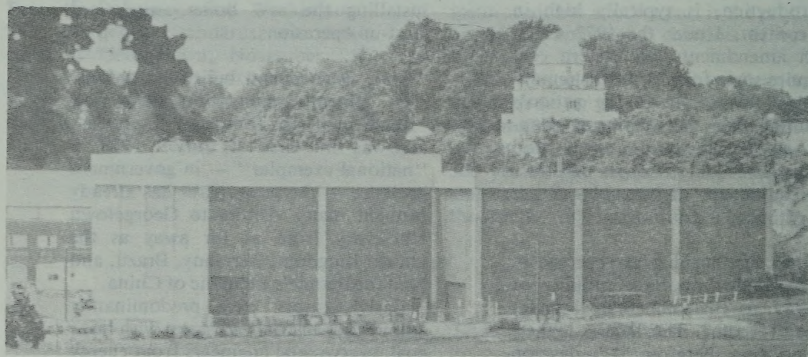
The entire program, including three years, of operation, costs about \$16 million, \$11 million of which was provided by the DOE for the design and construction of the unit. Georgetown's obligation was to operate the plant for at least three years during which the DOE would monitor and publish reports on the boiler's performance and the Environmental Protection Agency would conduct extensive pollution testing.

The new system has the capacity to generate sufficient steam to meet a substantial part of the University's energy requirements and is supplemented by two conventional gas/oil-fired boilers.

What will the payoff be? According to DOE Under Secretary John M. Deutch, "Expanding the nation's use of coal is essential if we are to maintain economic growth and reduce our vulnerability to foreign fuel supply disruption. The Georgetown fluidized bed system is a forerunner of future equipment that will permit that expansion while still preserving our environmental goals."

The powerplant may eventually become a significant contributor of power to the rest of the University. Once the capacity to co-generate electricity is added, the new plant will be able to put electricity, over that required for its own operation, into the institution's electrical grid.

This fortunate combination of factors would be a significant contribution to the University and the community. It will fit into the architectural scheme of the surrounding community and it will decrease the University's drain on the municipal power supply. Finally, the role of the new structure as a national exemplar will be enhanced significantly.



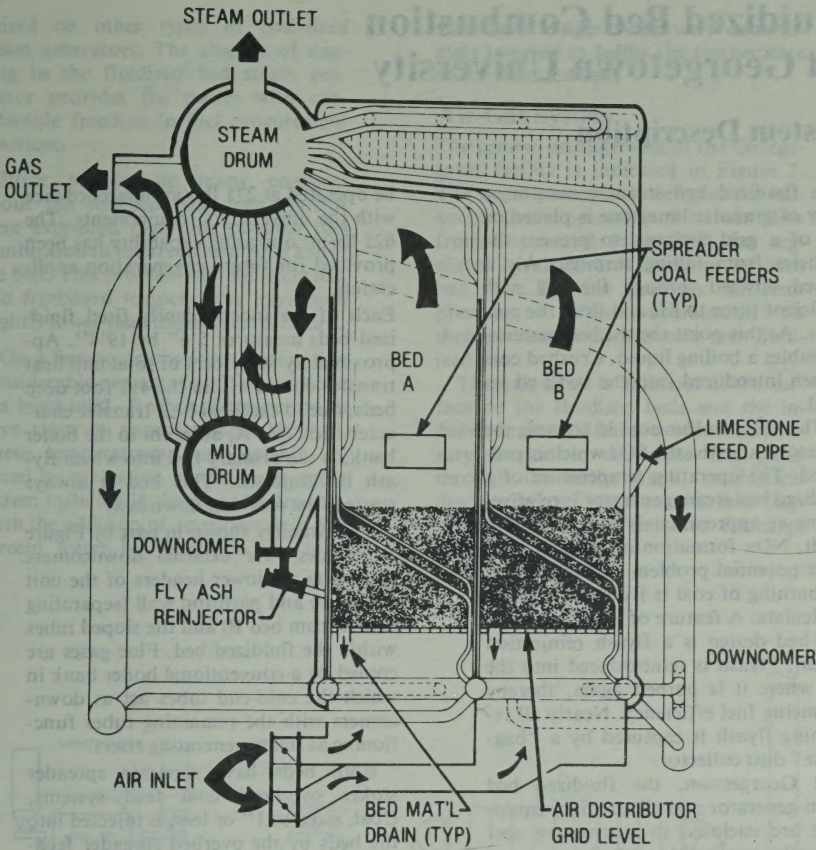


Figure 1

Fluidized Bed Combustion At Georgetown University

System Description

In a fluidized bed steam generator, a layer of granular limestone is placed on top of a grid designed to prevent the particles from falling through. Air is passed upward through the bed with sufficient force to lift and float the particles. At this point the the bed material resembles a boiling liquid. Crushed coal is then introduced into the bed and ignited.

When high-sulfur coal is burned, the limestone absorbs the SO_2 which is produced. The operating temperature of a fluidized bed steam generator is relatively low at approximately 1600° F. As a result, NO_x formation is minimal. Another potential problem encountered in the burning of coal is flyash, a form of particulate. A feature of the G.U. fluidized bed design is a flyash reinjection system. Flyash is reintroduced into the bed where it is burned again, thereby enhancing fuel efficiency. Nearly all remaining flyash is captured by a "bag-house" dust collector.

At Georgetown, the fluidized bed steam generator and all auxiliary equipment are enclosed in a structure aesthetically compatible with the surrounding university complex. The steam generator has two separate beds which can be fired independently, and operation to date has been with one and two beds in service based on steam load demand.

Steam Generator Design

A cross section of the Georgetown installation (Figure 1) indicates the natural circulation design which can generate 100,000 lb/hr of saturated steam at pressures between 275 and 625 lb/in². Under normal conditions, the unit will

be operated at 275 lb./in² in accordance with the university's requirements. The 625 lb/in² operating capability has been provided for future cogeneration application.

Each of the independently fired fluidized beds measures 5'6" by 19'4". Approximately 50 percent of total unit heat transfer occurs within the 4½ foot deep beds, due to excellent heat transfer characteristics. Bed A, adjacent to the boiler bank, is the primary bed into which flyash is reinjected. This bed is always started first and shut down last.

The circuitry shown in part by Figure 1 includes four external downcomers supplying the lower headers of the unit enclosure and partition wall (separating bed A from bed B) and the sloped tubes within the fluidized bed. Flue gases are cooled by a conventional boiler bank in which the cold-end tubes act as downcomers with the remaining tubes functioning as steam generating risers.

Both beds have separate spreader stoker overhead coal feed systems. Coal, sized to 1" or less, is injected into the beds by the overbed spreader feeders. These feeders do not require drying of the coal and have performed well during operation. Sized to less than 1/8", limestone is fed by gravity at a single point in each bed. Due to the long residence of time of the limestone in the fluidized bed and the rapid burning rate of the coal, less than five percent of the bed consists of fuel.

Since the fluidized bed operates at a temperature of 1600° F, well below the ash softening temperature of the fuel, no slag formation occurs. This eliminates the need for sootblowers as re-

quired on other types of coal-fired steam generators. The absence of slagging in the fluidized bed steam generator provides the owner with considerable freedom in fuel procurement practices.

Prior to start-up many concerns about the overbed coal feed systems were expressed regarding possible fuel combustion in the freeboard zone above the bed. This problem has not occurred, and freeboard temperatures have been slightly lower than the bed temperature.

On a few occasions when coal with a considerable percentage of fine particles has been used, freeboard temperatures have risen to approximately 1800° F. These temperatures were quickly reduced by activation of the water spray system installed in the spreader feeders. With the addition of approximately five percent water by weight to the coal,

freeboard temperatures were immediately lowered to below the temperature of the fluidized bed.

Air-Gas System

The general arrangement of the Georgetown facility is indicated in Figure 2. The steam generator is designed for balanced draft operation with air flow from the forced draft (FD) fan regulated by air control dampers for each bed. The FD fan provides sufficient pressure to force combustion air through the air distributors and fluidized bed.

The unit draft is balanced at the surface of the fluidized beds and the induced draft (ID) fan provides the necessary suction to draw the flue gases through the boiler bank, mechanical dust collector, economizer, and bag-house dust collector prior to discharge through the stack.

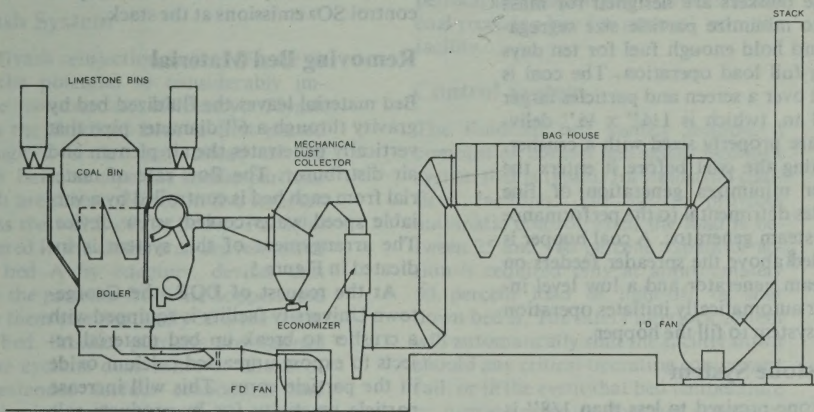


Figure 2

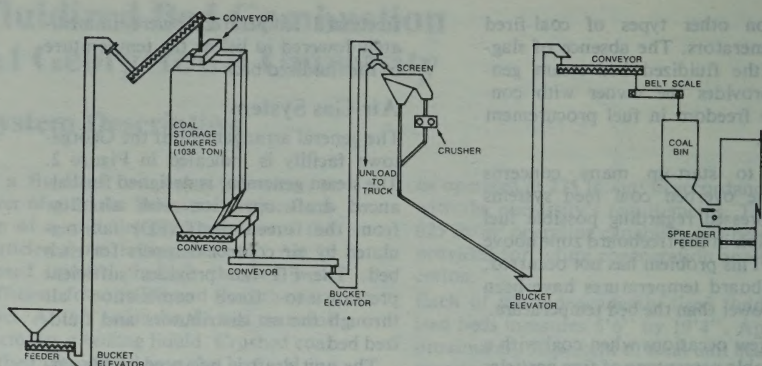


Figure 3

Fuel System

To satisfy environmental and aesthetic considerations, coal is delivered to the site in covered trucks and unloaded inside the building, which houses the entire facility. The equipment included in the coal receiving, storage, and feeding system is shown in Figure 3. The coal storage bunkers are designed for mass flow to minimize particle size segregation and hold enough fuel for ten days during full load operation. The coal is passed over a screen and particles larger than 1 in. (which is $1\frac{1}{4}$ " x $\frac{1}{2}$ " delivered) are properly sized with a crusher. Screening the coal before it enters the crusher minimizes generation of fine particles detrimental to the performance of the steam generator. A coal hopper is provided above the spreader feeders on the steam generator and a low level indicator automatically initiates operation of the system to fill the hopper.

Limestone System

Limestone presized to less than $1/8$ " is delivered to the plant by trucks equipped with blowers which convey the limestone to the bunker shown in Figure 4. This structure is designed for mass flow like the coal bunkers and holds a

ten-day supply during full load operation. Limestone from the bunker is pneumatically transported to bins above each fluidized bed. The discharge from each limestone bin is measured by weightbelt scales before falling by gravity to the beds. Limestone flow is regulated as a ratio of the coal flow, and this ratio is adjusted automatically to control SO_2 emissions at the stack.

Removing Bed Material

Bed material leaves the fluidized bed by gravity through a 6" diameter pipe that vertically penetrates the air plenum and air distributor. The flow rate of material from each bed is controlled by a variable speed water-cooled screw device. The arrangement of this system is indicated in Figure 5.

At the request of DOE, the Georgetown University facility is equipped with a crusher to break up bed material rejects to expose unreacted calcium oxide in the particle cores. This will increase particle reactivity for by-products sale possibilities being evaluated by DOE.

Bed material discharged from the screw coolers is pneumatically conveyed to the crusher and the crushed material is then transported in the same way to a

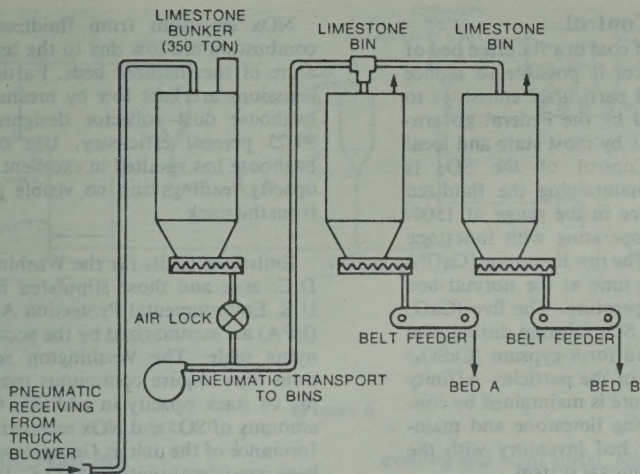


Figure 4

storage silo within the building. Spent material is discharged to trucks within the coal receiving bay for removal from the facility.

Flyash System

The flyash reinjection system (Figure 6) has the potential to considerably improve combustion efficiency. Flyash from the fluidized beds is first passed through a cinder trap ahead of the boiler bank to separate coarse particles which are then collected in five hoppers across the width of the boiler. Particles gathered in the cinder trap are reinjected into bed A by eductors, devices that draw the particles from the hoppers and blow them pneumatically into the fluidized bed. Smaller particles are trapped in the cyclone dust collector ahead of the extended surface economizer and are also injected pneumatically into bed A by means of five eductors.

Particles not captured in the cyclone unit pass over the economizer to a high-

ly efficient baghouse dust collector. Particles captured in the baghouse are pneumatically conveyed to the ash silo within the building, and this material is periodically discharged to trucks in the coal receiving bay for removal from the facility.

Control System

The fluidized bed facility includes a combustion control and safety interlock system that is typical for industrial coal-fired facilities. The system provides automatic control when the load is between 25 and 100 percent. Operator action is required only at approximately 50 percent load to light-off or shut down bed B. The safety interlock system will automatically shut the facility down should any critical operating component fail, or in the event that bed temperature or furnace pressure does not remain in the proper range.

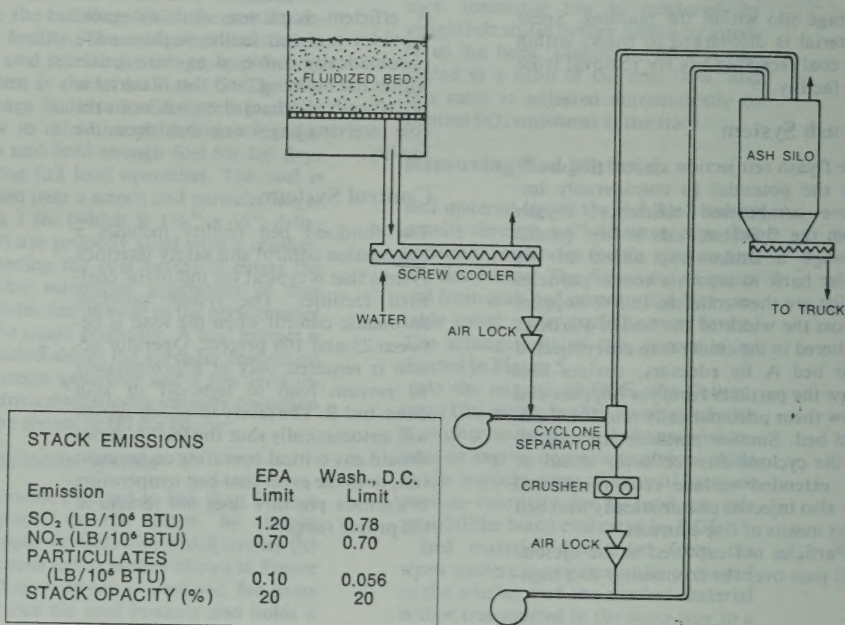
Emissions Control

Combustion of coal in a fluidized bed of limestone makes it possible to reduce SO_2 , NO_x and particulate emissions to levels specified by the Federal government as well as by most state and local authorities. Control of the SO_2 is achieved by maintaining the fluidized bed temperature in the range of 1500-1600° F and operating with limestone bed material. The raw limestone (CaCO_3) will calcine to lime at the normal bed operating temperature. The live (CaO) will react with SO_2 released during coal combustion and form gypsum (CaSO_4) on the surface of the particles. Affinity for sulfur capture is maintained by continuously feeding limestone and maintaining proper bed inventory with the bed material removal system.

NO_x emissions from fluidized bed combustion are low due to the temperature of the fluidized beds. Particulate emissions are kept low by means of a baghouse dust collector designed for 99.75 percent efficiency. Use of the baghouse has resulted in excellent stack opacity readings and no visible plume from the stack.

Emissions limits for the Washington, D.C. area and those stipulated by the U.S. Environmental Protection Agency (EPA) are summarized by the accompanying table. The Washington regulations also require continuous monitoring of stack opacity in addition to the amounts of SO_2 and NO_x released. Performance of the unit at Georgetown has been consistently within the D.C. limits.

Figure 5



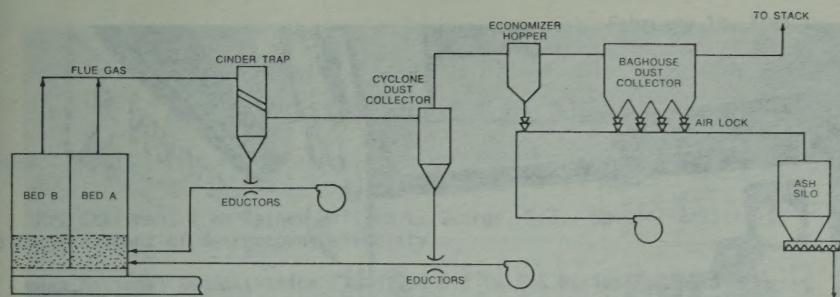


Figure 6

Operator Training

At the majority of facilities where fluidized bed steam generators will be used in the future, operators will probably lack experience with coal-fired boilers. Since this was the situation at Georgetown, great emphasis was placed on operator training. The training program implemented at the university three months prior to unit start-up played an important part in the overall success of the project.

Classroom discussion, slide presentations, and equipment inspection were employed to familiarize operators with the following areas thoroughly:

- General theory in the design of fluidized bed steam generators, with special attention paid to design details of the Georgetown unit
- Start-up procedures
- Control logic and safety interlock programs
- Maintenance and spare parts programs

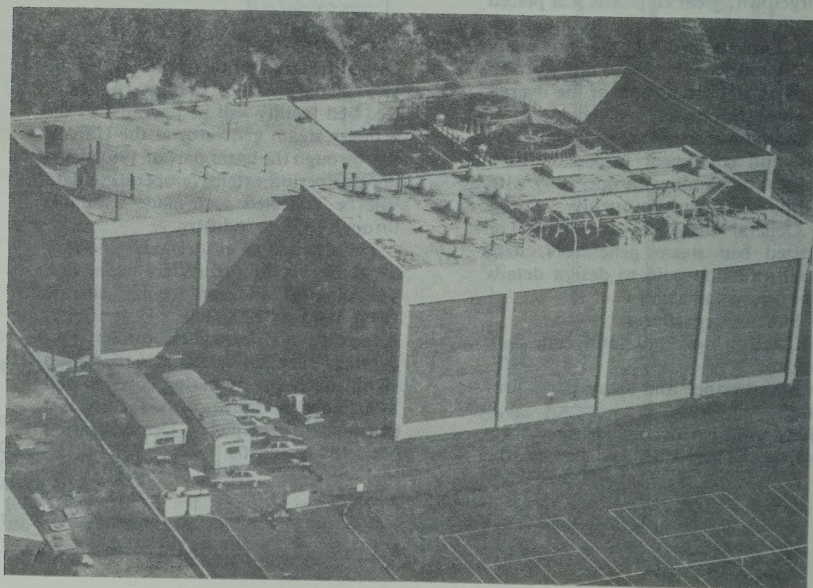
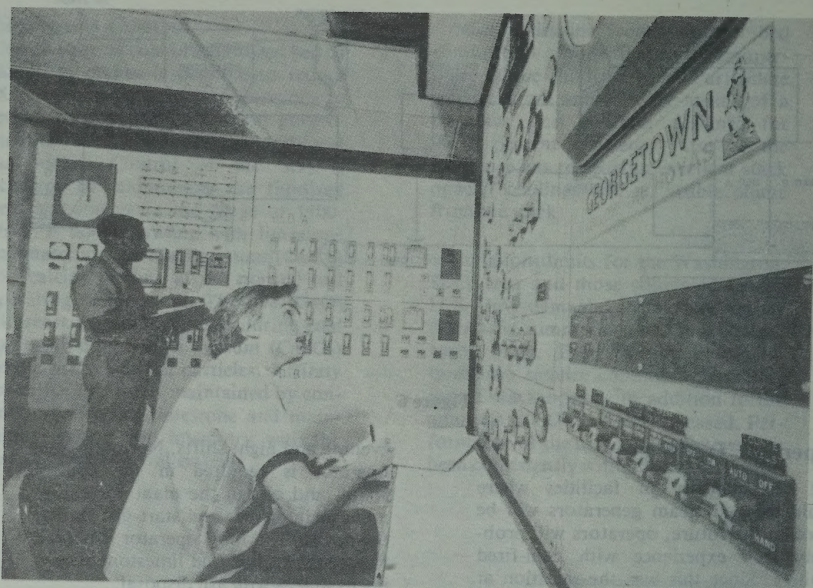
Staff requirements include three operators on the day shift and two on the

evening and night shifts. Normally, one operator is required in the control room, and one in the plant for equipment maintenance and start-up. During the day shift, a third operator is needed to assist with fuel and limestone receiving as well as with ash disposal.

Future Plans

Under the terms of the contract with the U.S. Department of Energy, the fluidized bed facility will be operated as the primary steam generator at the University through the latter part of 1981. During this period extensive operating data will be collected and made available through DOE to industry.

Plans to add an electrical cogenerator capability to the facility are underway. The planned addition would generate from 1000 to 2300 KW of electricity. According to feasibility studies performed, such an addition will reduce significantly the operating costs as well as enhance the status of the facility as a National Exemplar Demonstration Model.



February 19, 1981

APPROPRIATIONS SUBCOMMITTEE ON THE INTERIOR

Mr. Chairman, I am Father William L. George, S.J., Special Assistant to the President of Georgetown University.

The National Demonstration Fluidized Bed in the Nation's Capital at Georgetown University is functioning well. I intend to give a brief report and make a specific request of your Committee for support of the co-generation phase of the demonstration (est. \$2.7 million).

The boiler managed to get us through the coldest part of the winter. When our fuel supply company notified us that we would not receive gas due to the national shortages, we were not impacted, since we were burning coal. Georgetown Community residents are still surprised when they hear that we are burning coal, commenting that they have not noticed any delivery trucks, smoke, smell or noise. This demonstrates that proper planning with appropriate technology can be quite effective.

The Department of Energy required the University to build this boiler to handle co-generation at a greater pressure (100,000 lbs/hr./625 psi). The boiler requires this pressure to run at optimum efficiency. The University's steam needs can be supplied at 275 psi. Therefore, as part of the Demonstration, the turbine and storage necessary for cogeneration is essential for the success of this project.

This AFB is intended to stimulate the adoption of this method of coal combustion by industry, thus decreasing industrial dependency on scarce and imported fuels. Industry's adoption of this method of burning coal depends on the demonstrated value of cogeneration when joined to the AFB Boiler. The turbines and ash storage necessary to complete this phase of the demonstration are critically needed. I would ask the Committee to provide the essential \$2.7 million to this end. The fabrication of the turbines must begin as soon as possible. Every delay in committing to the fabrication delays the system's acceptability to industry.

We are negotiating with the Department of Energy ^{on} innovative methods of re-paying the cost of the co-generation through demonstrated energy savings. This method will clearly demonstrate the payback of this system to other potential users.

There is need for a strategy to preserve essential community power services in case of power failures at the central facility. A very limited number of power line switch over points control emergency services, which easily could be simultaneously inoperable effecting most major cities. A system of strategic co-generators within a particular community could prevent such a disaster. We have discussed this concept with our local power company, PEPCO, which sees a potential benefit by keeping their capital costs down as a result of community systems' cogeneration. It is

important from this point of view that co-generators be demonstrated in the practical order. The reliability and management of the program should result in benefits for both PEPCO and the Georgetown University community. Such a demonstration will develop measureable data to be used in designing a broader economic energy strategy.

In order for the negotiations with the Department to be timely, your Committee's support is necessary. This program has the potential to demonstrate:

1. Commercial viability and benefits of AFB with cogeneration.
2. An innovative method of payback through cost savings.
3. A strategy of community systems to benefit both communities and power companies through joint savings and protection against central utility plant failures.

We thank the Committee for its interest and wisdom in the preservation and regulation of migratory water fowl. Father Collins and I appreciated using more efficient lead shot this year on Maryland's Eastern Shore.

On behalf of our President, Rev. Timothy S. Healy, S.J., we thank you for the opportunity to appear before this Committee.

GEORGETOWN UNIVERSITY

FLUIDIZED BED

STEAM GENERATION SYSTEM

STEAM GENERATOR DESIGN PARAMETERS

Steam Flow - 100,000 lbs/hr, 625 psig saturated
Coal Flow - 4.782 tons/hr at full load
Limestone Flow - 1.52 tons/hr at full load
Coal Specifications - Bituminous, 12,750 BTU/lb, 3.3% Sulfur

PROGRAM COST (July, 1976 - August 1982)

Design	\$ 1.1 Million	
Construction	8.0 Million	
Mgmt, Rptg	1.8 Million	Government Funded
Operational Support	---.9 Million	
Operation	4.6 Million	Georgetown University
	\$16.4 Million	

OPERATING HISTORY

	1979 HOURS	1980 HOURS	1981 HOURS
January		206	276
February		257	337 (thru 2/15)
March		339	
April		329	
May		552	
June		216	
July	16	193	
August	93	455	
September	104	564	
October	199	642	
November	360	55	
December	134	481	
TOTAL HOURS	906	4289	613
TOTAL STEAM (000 lbs)	32720	168,260	36,205
AVERAGE STEAM (000 lbs/hr)	36	39	59

PUBLIC INTEREST

- Articles in several national publications
- TV and Radio coverage
- Visitors (Since November 15, 1979) (Approximately 2000)

Organizations - American Institute of Chemical Engineers, ASHRE, Rubber Manufacturers Association, Alexandria League of Women Voters, Electric Power Research Institute, Potomac Electric Power Company.

Countries - Germany, Japan, Sweden, People's Republic of China, Canada, Mexico, Brazil, U. of South Africa, England, Italy, India, Philippines, Israel, Zimbabwe, Australia

I would like to thank you for helping us to build it at a very early stage. The Department of Energy is very efficient when it comes to that level and we are maintaining the accurate life cycle of the boiler. We would like to ask you to help us to do that. We are negotiating with the Treasury and the EPA to get the funds to do that. We are negotiating with the EPA to get the funds to do that. We are negotiating with the EPA to get the funds to do that.

Mr. McDade. Just to refresh my recollection, what was the initial date we started this effort at Georgetown to demonstrate this?

Father George. It was when the boiler started working.

Mr. McDade. When did they begin the whole process?

Father George. In 1976.

Mr. McDade. In what year were you declared a success story as the first commercial application of a fluidized bed?

Father George. Well, it was last year when it was on-line. It went on-line a year ago in November.

GEORGETOWN UNIVERSITY
COGENERATION AND ADDED ASH STORAGE

PROJECTED CASH FLOW

(Estimated in 1980 Dollars).

	FY '81*	FY '82	FY '83
FINAL DESIGN	\$150,000		(If portion is delayed)
TURBINE GENERATOR PREPURCHASE			
Shop Drawings	150,000		
Fabricate/Deliver	-	\$ 350,000	
CONSTRUCTION	-	750,000	\$800,000
	<u>\$300,000</u>	<u>\$1,100,000</u>	<u>\$800,000 = \$2,200,000</u>
			500,000
		Contingency	<u>\$2,700,000</u>

* BASED ON MARCH 1, 1981 START

OPENING REMARKS

Father GEORGE. I am Father William George, Special Assistant to the President of Georgetown University. I will be brief; Father Collins has taught me well.

I would like to mention some statistics here concerning the National Demonstration Fluidized Bed in the Nation's Capital and then ask the committee for its support for co-generation if it is necessary.

It was in 1974 when we first could not get oil or gas and had to close down the university for a couple of extra months that the university decided that we had to get something that was available and went to coal. Again this year we were advised by our suppliers that we could not have any gas because New England was having a problem and we could sort of smile this time and say we really don't need it, we are burning coal. We got through the winter quite easily.

When it comes to residents in Georgetown, they still seem to be surprised when we tell them we are burning coal. They don't smell anything, they don't see anything and they don't have any interruption because of delivery trucks. We have schedules so with the appropriate planning and technology we can do the job even in so-called historical districts like Georgetown.

I want to thank you for getting us that far. When we put in the boiler, the Department of Energy required us to build it at a very high pounds per square inch. The boiler is more efficient when it runs at that level and in order to maintain the accurate life cycle costing of the boiler it is necessary to have the co-generation added to it. We would like to ask the committee for the funds to do that. We estimate \$2.2 million to \$2.7 million to complete that.

We are negotiating with the DOE realizing that we would pay the cost for the co-generation in which we would, out of energy savings, return to the Treasury funds that we received for the co-generation project and it would also at the same time demonstrate the fact that you do save neodollars on an annual basis by the addition of co-generation. I think that will help budgets a little bit.

We have been discussing with our own power company, PEPCO, different strategies and managerial methods for co-generation because the power companies are definitely involved. Both of us realize there are savings to both parties and benefits to the community, capital cost for the power companies perhaps meaning a bit of a backup for emergency services in case there is a blackout.

I would like to add my final plug, as I usually do, for the guests from Canada who come in every winter to Eastern Shore. Father Collins has managed to get the guests on two rather than one and I would like to hear the continuing support of that one. At least on the Eastern Shore I think the resurgence helped us.

Mr. McDADE. Just to refresh my recollection, what was the initial date we started this effort at Georgetown to demonstrate this?

Father GEORGE. It was when the boiler started working.

Mr. McDADE. When did they begin the whole process?

Father GEORGE. In 1975.

Mr. McDADE. In what year were you declared a success story as the first commercial application of a fluidized breadboard?

Father GEORGE. Well, it was last year when it was on-line. It went on-line a year ago in November.

Mr. McDADE. So you had the only commercial demonstration of a fluidized bed in the United States of America that has proven to be successful?

Father GEORGE. Yes.

Mr. McDADE. What you are telling the committee is that because of the specs, you had to operate the boiler, was at a much higher spec because it was contemplated that there would be a co-generation attached to it to increase the efficiency of the stand. Is that essentially it?

Father GEORGE. Yes.

Mr. McDADE. What has happened now is that you have gone through it; you have demonstrated it; you have said that the citizens of Georgetown are doing it but you call for \$2.2 million.

Father GEORGE. From \$2.2 million to \$2.7 million.

Mr. McDADE. What do you estimate is the potential incremental co-generation savings, for the \$2.2 million? Can you provide a figure yet?

Father GEORGE. We are estimating but they are soft estimates. It could be anywhere from a quarter of a million dollars to half a million dollars. It depends what the other prices of other fuels are. Right now we estimate we could perhaps save \$300,000 a year. That \$300,000 is the base we would work from with the Department of Energy or more. If you listen to the dreamers, they would say it could save you a half million dollars a year in electric cost. Good engineers will say that it has to be tried and true.

Mr. McDADE. Yours is the only commercial success story in the country and now we are talking about upgrading that success story by \$2.2 million.

Father GEORGE. Yes.

Mr. McDADE. What is the total investment of this breadboard?

Father GEORGE. Right now?

Mr. McDADE. Yes.

Father GEORGE. It is in the record. About \$16 million.

Mr. McDADE. So for \$2.2 million you might get a very large increase in efficiency.

Father GEORGE. Right.

Mr. LOEFFLER. Thank you, Father.

Father GEORGE. Thank you.

ENERGETICS, INCORPORATED

DOE—INDUSTRIAL CONSERVATION

WITNESS

THOMAS S. BUSTARD, PH. D., PRESIDENT, ENERGETICS, INC.

Mr. LOEFFLER. Energetics, Incorporated, Mr. Bustard.

Without objection, your prepared testimony will appear in the record at this point.

[Material follows:]

TESTIMONY

OF

THOMAS S. BUSTARD, PHD, PE

PRESIDENT

ENERGETICS, INCORPORATED

2000 Century Plaza

Columbia, Maryland 21044

before the House Appropriations Subcommittee for Interior and
Related Agencies

February 19, 1981

This statement addresses the proposed \$35,800,000 rescission to the U.S. Department of Energy's FY 1981 budget authority for the Industrial Energy Conservation Program.

For the past several years, I have been involved in performing technical and economic analyses for the DOE, in particular projects sponsored by the Office of Industrial Programs. As a result of these activities, I have become thoroughly familiar with, and particularly knowledgeable about these projects from the standpoint of estimating the energy savings to be achieved and the Federal and private sector costs associated with realizing these savings.

The Industrial Energy Conservation Program is a relatively new Federal activity. However, the Program has already been responsible for the development of industrial conservation technologies that have achieved estimated energy savings of approximately six trillion Btu's, or an equivalent to more than one million barrels of oil. Considering the inherent time lag between initiating any research and development activity and introducing the technology into the marketplace, this is truly a meritorious achievement. This emphasizes the positive cost benefit aspects available from conservation technologies. In addition, the six trillion Btu's represent energy savings from only a few of the many ongoing projects that the Office is sponsoring. More specifically, the savings have been realized from twelve projects which were initiated early in the Program. These twelve endeavors have yet to realize but a fraction of their market penetration and therefore energy savings potential. In fact, in each case there are no more than 30 or so units currently in operation. Considering that these alone have contributed to the savings attained and recognizing that their marketplace potential is in the hundreds to even thousands of units, the energy savings to be achieved during the lifetime of the units is significant.

To date, about one sixth of the total Federal investment in the Industrial Energy Conservation Program has already been returned to the national economy. That is, 25 million dollars in energy savings have already been realized from the 148 million dollars authorized for the Program

from FY 1977 through FY 1980. Recognizing that the successful energy-savings technologies developed are only in the early stages of penetrating the market and that these units have extended lifetimes, the result will be continued and additional energy savings for many years. In fact, the relatively few in-place units are now providing annual energy savings in excess of six trillion Btu's per year. As more units penetrate the market this figure will increase dramatically. The actual return on the Federal investment will be significant. Stating it somewhat differently, the Federal monies spent on the Industrial Energy Conservation Program prove not to be a burden on the economy, but rather a benefit to it.

The Industrial Energy Conservation Program has been well structured by DOE management to achieve its end objectives. It consists of many relatively small undertakings rather than several large projects. This approach minimizes the overall risk of failure while ensuring a broad spectrum of industrial applications. Although some projects will ultimately fail in the R&D process, the energy savings realized from those that prove successful will more than compensate for the expected failures. This is an important aspect given that the Program's strategy is directed toward sponsoring research and development of high-risk, large energy-savings technologies which would not have been undertaken by industry independently.

The \$35,800,000 rescission from the Program's FY 1981 budget will result in the elimination of more than 15 individual research and development projects from the Program's portfolio and a reduction in the planned scope of endeavors which are currently experiencing acceptance and success. For example, a project falling into the latter category is a planned expansion in the number of the Energy Analysis and Diagnostic Centers (EADC). Briefly, this project presently funds six university engineering teams who conduct energy audits and cost benefit analyses for small and medium-sized manufacturing firms. The 105 firms that participated in the program in 1979 are expected to save \$1,400,000 in annual energy costs because of conservation measures adopted as a result of the audits. The annual rate of return for the total Federal and private investment to achieve these savings is estimated to be almost 100 percent. In addition, the EADC project provides valuable energy related training to engineering students associated with the EADC's. Quoting the November 3, 1980 issue of Energy User News - "Plant engineers contacted last week said they probably could not have afforded to hire an energy auditing firm, and thus would not have had an energy audit of their plants if not for the government sponsored program". In other words, without the Federal effort, these energy savings would not have been realized.

The rescission will mean eliminating a number of new, innovative and promising research and development efforts. These include: a totally new fluidic concept for measuring high temperatures; a novel method for increasing the quality of low grade waste heat, development of a slagging burner, several unique cogeneration concepts and development of advanced automatic control systems and sensors; etc. Moreover, the rescission will also preclude the development of a more environmentally acceptable method for producing coke.

INDUSTRIAL CONSERVATION
WITNESS
THOMAS E. BUSTARD, PH.D., PRESIDENT, ENERGETICS, INC.
Mr. Bustard, Energetics Incorporated, Mr. Bustard
Without objection, your prepared testimony will appear in the
record at this point.
[Material follows]

The projects to be eliminated as a result of any budget authority rescission in the Program are typical of industrial conservation activities: large energy savings potential; and with the reduction of risk, economically attractive. For example, the estimated cost per barrel of oil equivalent saved by for the technologies range from \$4.14 to \$8.33. These costs include both Federal and private sector costs. However, the Federal costs are a small fraction of these totals, averaging about twenty-five to fifty cents per barrel of oil equivalent saved. Many Americans would appreciate paying this amount for a barrel of oil.

The question remains however, whether these efforts would be pursued independently by private industry if Federal support is deleted. In my opinion the answer is clearly that they would not. Industry, and in particular the in-line process industries, which are the large energy consumers, traditionally shun the high-risk endeavors represented by these activities. In fact during a time of increased energy prices and a sluggish economy, they place a decreased emphasis on research and development in general.

There is no doubt that energy represents one of the more important problems facing the United States today. Despite its significance, less than one percent of the present Federal budget is directed toward addressing the energy situation. Most energy experts believe that conservation should be the cornerstone of a strategy to alleviating the energy dilemma in the short term. However, less than one-half of one percent of the FY 1981 Federal budget is allocated to conservation and only one-tenth of the conservation budget is directed toward technology development. This represents a paradox of emphasis by the Federal government. When faced with increased energy prices and shortages, we as individuals turn first to conservation. Should the government react differently? I think not.

Perhaps more alarming is the fact that the budget authority rescission in question seems to be only the first step in an overall trend to de-emphasize the already somewhat meager Federal efforts in conservation technology development. The new approach seems to be one of enforced conservation through increased energy prices. Unfortunately, this philosophy does not take into account the fact that conservation measures proceed in three rather distinct phases. The first phase is commonly termed house-keeping and consists of cutting back thermostats, turning off lights and appliances when not in use and wearing sweaters. At this point we've mostly exhausted these measures. The last two phases, which I term, retrofit and new technologies are just beginning. They are not so well defined and although somewhat more costly than house-keeping conservation measures, they are both highly economical when compared to energy supply side considerations. It is extremely important that the Federal government provide the stimulus necessary to propagate the latter two phases of conservation to the fullest extent possible.

If Ben Franklin were alive today he would have at least agreed that a barrel of oil saved is equivalent to a barrel of oil found. It is certainly far less costly and difficult to save a barrel of oil than it is to find one or to make one by synthetic means.

Thank you for giving me the opportunity to speak today.

Mr. LOEFFLER. You may proceed.

OPENING REMARKS

Mr. BUSTARD. Thank you.

I am here to talk about the Office of Industrial Programs and the Industrial Energy Conservation Program. I have been involved for the last several years in performing technical and economic analyses for the Department of Energy and in fact I have addressed a goodly number of the projects which are contained in the portfolio and as a result I have become fairly familiar with these programs from the technical and economic standpoint.

The program is slightly more than four years old at this point in time, yet despite its newness as a Federal activity the energy savings that it achieves today approximate some six trillion BTUs. Now when you consider that there is an inherent time lag between the initiation of a research and development effort and the time you get a technology to the point that it is up and operational, it is a very remarkable achievement and as a matter of fact the savings which have been accrued by the program today have come from some 12 technologies which were initiated very early in the program.

The total effort consists of more than 150 research and development efforts and there are a good many of them that are still in the pipeline that have not had the opportunity but had the research and development phase completed. Even the 12 units which achieved six billion BTUs, the 12 technologies have not realized even a small portion of their market. I don't think in any single instance that they have more than 30 or 50 units of any type technology in operation that have been contributing to these energy savings.

When you consider then the four years that the program has been in operation and the total budget authority has been \$148 million, it has already returned to the national economy about six billion BTUs in energy or \$25 million in energy savings represented by the six trillion BTUs. In addition, the units that are presently in operation are accumulating today energy savings at an annualized rate of six billion BTUs, if at this year end nothing else 12 trillion BTUs in energy savings.

Mr. LOEFFLER. How much is that in barrels?

Mr. BUSTARD. A little more than one million barrels. The energy cost may be \$25 million.

So, as I say, if things were to proceed without anything further being done, the program would accumulate the six trillion BTUs per year in annualized energy savings. In addition, the 12 technologies which are contributing to these energy savings are going to further penetrate the market because most of these units have lifetimes of 15 or 20 years. You can see that the recurrence on the Federal end is going to be relatively significant.

The program as it has been structured by DOE management includes a number of relatively smaller plans. There are almost 150 research and development projects contained within those industrial energy conservation programs as compared to just several large projects. Because the program is geared to where it is high risk technologies that have potential energy savings, this is one way to have the program structured because there will be some of these technologies that will fail in the research and development

phase. What is past is proven and is starting to prove more and more conclusively. The failures will be much more than compensated by that success.

FISCAL YEAR 1981 RESCISSION

I came in to talk initially about the \$35 million proposed rescission to the fiscal year 1981 budget. I have since learned that they intend to perhaps zero the program to fiscal year 1982. I think that would be extremely ill-advised. Even this \$35 million rescission to the fiscal year 1981 budget would mean not starting 15 independent technologies and these technologies are typical of industrial energy conservation programs over there. They have large potential energy savings. The cost per barrel of oil equivalent, say this is the private and Federal sector cost, as a result of these activities will range between four and eight dollars a barrel with the Federal cost being only a small cost of that—the Federal cost when you say this comes in at 25 to 55 cents per barrel.

The rescission would also preclude the expansion of several programs which have been highly successful in the plant and one of these is the Energy Analysis and Diagnostic Centers. Briefly, this project presently funds six university engineering medium-sized manufacturing firms. In 1979 there were three such university centers in operation and they performed 105 energy audits. As the result of the actions taken by the firms that were involved in those audits, they are presently saving \$1.4 million per year in energy savings. The annualized rate of return for both the Federal and private sector investment in this instance has been close to 100 percent per year.

The program has the added benefit that it exposes engineering students to energy technologies and energy management and serves to increase the trained basic personnel of the United States along the energy conservation lines. When it comes to the point of what seems to be continually addressed of whether or not these types of engineers would be sponsored by a loan, there was a large article in the November 3, 1980, issue of Energy User News, "Plant engineers contacted last week said they probably could not have afforded to hire an energy auditing firm, and thus would not have had an energy audit of their plants if not for the government sponsored program." In other words, without the Federal effort this energy savings would not have been achieved.

As I say, in addition the rescission would mean the elimination of a number of promising research and development efforts. There is a novel method for increasing the quality of low grade waste heat and there are several unique co-generation concepts. There is a new fluidic concept for measuring high temperatures. There is development of some automatic energy management control systems and advance sensors that are involved and it would also preclude an effort to develop a new method for making coke from rather common coal and the method that is more environmentally acceptable than the present method is doing.

In my opinion there is no doubt that energy is one of the major problems facing the United States today and I think we all agree to that. Despite this, less than one percent of the Federal budget goes to work combatting the energy problem. Of this, less than one-half is devoted to the conservation and of the conservation budget less than 10 percent goes into technology development. The total con-

servation technology development budget is running somewhere in the neighborhood of \$300 million.

Now when we as individuals are faced with energy shortages and increased energy prices, we turn first to conservation. I think most energy experts agree that the conservation should be the cornerstone of any policy for dealing with the energy problem and short-term problem. One of the people giving testimony this morning said that we are looking at oil prices of possibly \$100 a barrel in 1985. There is nothing that can be done on the supply side to combat that kind of a risk in energy price. There is a great deal that can be done in the conservation technology area side.

CONSERVATION TECHNOLOGY

If the new administration is looking to enforce conservation by means of increased energy prices, I think they are negating two of the important aspects of conservation technology. I believe conservation proceeds in three rather distinct steps. The first are two housekeeping measures and these are things that are obvious to us all. We push back our thermostats, we join a car pool, we put on a sweater, we turn off lights and appliances when they are not in use. Those are housekeeping measures that are rather simplistic and very obvious to everybody concerned.

There are two phases that are perhaps somewhat less distinct, retrofit and technology development base. In the retrofit area as far as industrial applications might go this would be the addition of an added fuel ratio control to a boiler or the use of a recuperator or free heating boiler, inland air. These steps are somewhat less well defined to the user. When you get into the technology development area, that is something which is limited only in one's imagination, the development of a new process or new procedure to accomplish the same thing in a less energy intensified manner.

While the latter two phases of conservation are less obvious, they are still highly cost beneficial. I believe it is extremely important that the Federal Government provide the stimulus necessary to propagate the latter two phases of conservation to the fullest extent possible and I think in order to do that we need a very strong technology and development program in the area of conservation.

Thank you.

NATIONAL WILDLIFE FEDERATION

DOE—CONSERVATION PROGRAMS

WITNESS

JOAN B. HABIB, DIRECTOR OF ENERGY PROGRAM, NATIONAL WILDLIFE FEDERATION

Mr. LOEFFLER. National Wildlife Federation, Ms. Habib.
Your statement will be made part of the record at this point.
[Material follows:]

TESTIMONY OF

JOAN B. HABIB

DIRECTOR OF ENERGY PROGRAM

OF THE

NATIONAL WILDLIFE FEDERATION

NATIONAL WILDLIFE FEDERATION

1412 Sixteenth Street, N.W., Washington, D.C. 20036

202-797-6800

February 19, 1981

INTRODUCTION--NATIONAL WILDLIFE FEDERATION POLICY

Mr. Chairman, Members of the Committee, ladies and gentlemen. I am Joan Habib, director of the energy program of the National Wildlife Federation.

Founded in 1936, the Federation is the nation's largest grass-roots conservation and education organization. The National Wildlife Federation counts 4.6 million members and supporters.

At the last annual meeting of the Federation a resolution was passed by the membership which noted that... "energy conservation is the fastest, cheapest, and most environmentally benign way to reduce this nation's dependence on foreign oil" ... that ... "the federal government has thus far paid inadequate attention to the importance of energy conservation" and called upon the President and the Congress to "thoroughly investigate ways to encourage energy conservation and to implement a comprehensive energy conservation program."

This stated policy of the National Wildlife Federation brings me here to vigorously oppose the proposed cuts in the budget for Conservation Programs at the Department of Energy. The Federation (like everyone else) is in favor of efficiency in government as well as energy efficiency. We applaud efforts to eliminate waste and to seek out for support only those programs which will have the greatest return for the federal dollar expended.

But the budgets proposed for the DOE Conservation Programs do not represent a set of well-considered cuts to eliminate inefficiency. They unjustifiably terminate some of the most cost-efficient investments made by the federal government. And... if authorized, they will guarantee that the benefits of government expenditures during the last seven years in these areas will never be realized. They constitute the dismantling of major energy programs that were developed by the Congress over the past 7 years. They insure that none of the energy saving goals that were set by the Congress will be met.

These DOE Conservation Programs have represented only 8% of the total DOE civilian budget. They are now facing a 77% cut. Why?

Are they unnecessary?

Are they not cost-effective?

Are they unable to make a sizeable contribution to our available energy supply?

Are there better options?

Options

One of the goals of the Federal energy effort is to develop a balanced set of energy options. However, the Administration budget proposals have thrown balance to the winds, earmarking 70% of the DOE research and development budget to the nuclear option, while energy conservation is reduced to insignificance. Absent any objective cost-benefit analysis indicating that this emphasis is justified, we appear to be taking a foolish risk. No prudent investor would wager that amount without a significant hedge, especially given the history of the nuclear industry which, after 25 years of government subsidy, has been able to produce only 1.5 MMB/D. And we are now told that our old standby, wood, has surpassed nuclear power in the size of its contribution to our total energy supply.

Mr. Lowery, National Wildlife Federation, Mr. Hahn.

Your statement will be made part of the record at this point.
(Material follows)

We have committed tens of billions of dollars to the development of a synthetic fuels industry which is optimistically projected to produce 9 Quads by 1990 and now propose to ignore the much less costly conservation option with projected impacts (in the residential and commercial sectors alone), of 1.4 Quads by 1985. Recognizing the national wisdom of not putting all our eggs in one basket, the Congress included in the National Security Act of last year provisions for a Conservation and Solar Bank to stimulate use of renewable energy and energy conservation, as well as a mandate for synthetic fuels. What has happened to this concern for balanced options?

Potential

A central goal of Federal energy policy is to reduce our reliance on foreign sources of supply, not only because of the implications for national security, but because having control of the marginal cost of a major energy source in the hands of a foreign cartel is playing havoc with the national economy. Energy conservation presents the best (possibly only) near term solution. If current achievements are reproduced, the potential for "conservation energy" as a substitute for imported oil is as great or greater than for all other sources combined.

As far back as 1973, studies showed that conservation resulted in 3 million barrels per day in energy saved while only 4 million barrels per day were found from all other sources. More recent studies indicate that of the 38% of our total energy consumption is dedicated to industry. It is conservatively estimated that up to 11 Quads can be saved in this area by vigorous energy conservation. The end use of another 38% of all U.S. energy is heating, cooling, lighting our homes and commercial buildings. The potential saving in this area is 5 Quads. With aggressive Federal programs to encourage energy conservation we can capture a larger portion of this enormous economic potential.

Is it in the national interest to cut back programs which provide the best potential for decreasing our vulnerability to the cut-off of foreign oil?

Cost-Effectiveness

A national policy to accelerate energy conservation faster than market forces could push it, was not arrived at without cause and reasoned deliberation.

The ratio of money spent to money influenced in many of these programs is very high. The merit of these is illustrated by the success of the DOE-funded Energy Analysis and Diagnostic Centers, which provide energy audits for small firms. More than 50% of the time, users take the advice of the auditors and the savings are ten times greater than the cost of the program. The savings to the firms are equally impressive: a 99.4% rate of return on total investment. Examples of cost-effective and highly successful research efforts are the DOE Industrial Conservation Programs for waste energy reduction and industrial process efficiency. These joint venture programs are cost-shared with industry, leveraging the federal investment by a factor of 3 to 100 in some instances, and returning \$100 in energy saved for every dollar spent by the federal government.

Necessity

The arguments put forth by the administration that tax credits and oil and gas deregulation are sufficient to effect massive reduction in demand and to render government programs superfluous are simplistic and severely flawed. In the first instance, tax credits are applicable only to upper and middle income homeowners. Even of those eligible, IRS figures show that only 11% have taken advantage of the credit and that the modal credit was \$100, indicating relatively low levels of investment, well below the cost-effective optimum. As to the deregulation

questions, it seems presumptuous to count the gas chickens before Congress hatches them. But even with the total decontrol of oil and gas prices, the market will not bring about the desired level (or as the economists say, "socially optimal" level) of conservation. Even with deregulation, energy prices do not reflect their total costs to the nation. Missing are the national security costs and the numerous environmental costs that are not "assessed" through the present regulatory scheme. Additionally, consumers of electricity continue to pay average rather than marginal costs and numerous government subsidies for conventional supplies distort the market. Federal programs do make a difference.

Information is a basic element of free market theory, yet the administration proposes to reduce (to zero in some cases) those programs which either provide information and education to the public or facilitate technology transfer. Information dissemination is an especially appropriate government function as there are low or non-existent incentives for the private sector to provide unbiased information. Individuals in small companies, and even state and local government bodies, have neither information nor sufficient technical ability to determine the life-cycle costs of energy efficiency options. The burden of obtaining either information or professional help in decision making is expensive and time-consuming. Therefore, many consumers make decisions based on initial cost only. Even when these individuals or small companies or local governments have concluded that investments in energy efficiency are cost-effective, they are often unable to obtain the capital to invest--Federal loan programs can help.

Individual companies may not be willing to invest in energy conservation research because they cannot capture the benefits of that research--R&D programs cost-shared between industry and government can help.

Evaluation

The Administration proposal constitutes a haphazard reordering of energy policy through its wholesale attack on the Conservation Programs. There is no need for the Congress to run blindly off this cliff. Several options exist which could provide an orderly process for supporting good programs and cutting bad ones. The National Energy Policy III is in the works--the Congress could take the time to insist upon hearings to establish criteria for elimination or support of DOE programs. Or yet another process has already been provided by the Congress. Title X of the DOE Organization Act of 1977 requires a comprehensive and detailed report to the Congress on each of the DOE programs.

If the Congress is to benefit from this report in its decision-making, enough money should remain in the budget for 1981 to carry out an effective evaluation study. This report is scheduled to be delivered not later than January 15, 1982--less than 11 months from now. Waiting until the results of this or other appropriate evaluations are in is the best, fairest, and least disruptive method of determining optimal program balance, eliminating less cost-effective programs and substituting better programs when necessary.

Conclusions and Recommendations

The National Wildlife Federation recommends that:

- o Major Congressionally-mandated Federal programs to encourage energy conservation should be kept intact.
- o The DOE programs should be reviewed in an orderly fashion under the existing provisions of the Department of Energy Organization Act, the NEP III, or by Congressional hearing processes.

- o Those programs which are found wanting as the result of that careful evaluation should be cut at that time, or replaced with more effective programs.
- o Under no circumstances should the Congress allow the dismantling of energy conservation programs now.

The National Wildlife Federation believes that as a nation we have inherited a vast fortune in natural resources and that it is vital that we not squander our inheritance. Wasting energy is an unacceptable national pastime. Every effort of government should be expended to avoid such waste.

Mr. Lockyer, I had made a note earlier in your comments which says, "What cuts would you suggest?" Basically would you recommend that there be a delay in any cuts or do you have a method by which you would advise the committee to look at the reductions in government?

Ms. Harris, I think the Federation's view is not so much that we have specific programs which we would like to see but the standard answer is that we have programs we would like to see not cut. Energy decisions, techniques and technologies about the kind of information is a little mysterious. We feel that the government in this instance since the private sector has little or no incentive to

Mr. LOEFFLER. You may proceed.

Ms. HABIB. Thank you very much.

I must say that when I saw the Herbert Block cartoon this morning showing the dogs attacking the Reagan budget, I was not too sure I wanted to be identified with Reagan.

The National Wildlife Federation has a 4 million plus membership and has taken a very strong position that they support energy conservation and furthermore the second very strong position in favor of government support of energy conservation.

I will try to be very brief in our points. We feel that the current budget cuts in the conservation program are not well considered, carefully evaluated cuts. We find that the DOE has an enormous potential contribution to our available energy supply and that there are no better short-term options.

The arguments that have been put forth for the cuts of the Reagan administration suggest that tax incentives or the tax credits for deregulation of oil and gas will take care of the conservation and that we will achieve the potential to conservation without further government intervention. It is our position that that is probably not true, that there is an enormous potential for conservation which can be captured by Federal programs.

To that end, again to be very brief, we would suggest also that there be much more careful evaluation before cutting would be permissible and that there are several possibilities which the Congress might utilize to achieve those goals. In addition, the congressional hearings on specific programs, the DOE in Title X has a sense of provision which allows for an evaluation though it will be prepared eleven months from now in some sort of detailed fashion. So we know what these programs are going to be and why.

In addition to that, the national energy policy is in the works. In the main the positions of the Federation in the systems are that these major congressionally mandated problems should not be there, that they should be kept, in fact that the programs should at a minimum be reviewed in an orderly fashion before any cuts are made and that the programs after careful debate should be substituted by more effective programs if that is necessary but under no circumstances should the projects at this time allow for dramatic cuts in the energy conservation areas. The National Wildlife Federation believes that it is essential that we not be wasteful of our energy resources and that every action of government should be brought to bear to avoid waste, specifically the programs for conservation in the Department of Energy.

If there are questions, I will be happy to answer them.

Mr. LOEFFLER. I had made a note earlier in your comments which says, "What cuts would you suggest?" Basically would you recommend that there be a delay in any cuts or do you have a method by which you would advise the committee to look at the reductions in government?

Ms. HABIB. I think the Federation's view is not so much that we have specific programs which we would like to see but the standard answer is that we have programs we would like to see not cut. Energy decisions, techniques and technologies absent this kind of information is a little mysterious. We feel that the government in this instance, since the private sector has little or no incentive to

produce unbiased information for us, has a responsibility to maintain these programs in the areas that I mentioned under conservation information.

I think the previous label which indicated high effectiveness and a good return on the dollar are programs that should be looked at very carefully. All of the potential for energy savings in these areas in the industry, our total residential, commercial buildings and other, 38 percent of it is the only short-term answer to our problem. I am very concerned that we appear to be saying these problems will take care of themselves. I think not. I think that even though they will in some degree, there is still a responsibility of government to capture the largest portion of that potential that is being made available.

Mr. LOEFFLER. Thank you.

Ms. HABIB. Thank you.

EBASCO SERVICES INC.

DOE—FOSSIL ENERGY-COAL OIL MIXTURES

WITNESSES

EUGENE CHAO, VICE PRESIDENT, COAL OPERATIONS

S. B. COUSIN, DIRECTOR, SPECIAL SERVICES ENGINEERING

Mr. LOEFFLER. Ebasco Services Incorporated, Mr. Chao.

Without objection, your prepared statement will appear in the record at this point and you may proceed.

[Material follows:]

TESTIMONY FOR HOUSE APPROPRIATION'S
COMMITTEE/SUBCOMMITTEE ON INTERIOR
AND RELATED AGENCIES

STATEMENT OPPOSING COAL OIL MIXTURE
PROGRAM RESCISSION

Submitted By,

E Chao

Vice President, Coal Operations

and

S B Cousin

Director, Special Services Engineering

EBasco Services Inc.
New York, N.Y.

(212) 839-2975

PROVIDE FOR TOMORROW. SAVE ENERGY TODAY.

February 19, 1981

TESTIMONY FOR HOUSE APPROPRIATIONS COMMITTEE/SUBCOMMITTEE
ON INTERIOR AND RELATED AGENCIES

By E Chao, V.P. Coal Operations Division - Ebasco Services, Inc.

Good Morning, Distinguished Members of House Subcommittee on Interior and Related Agencies. Thank you for the opportunity to present what I consider to be important information. In particular, we support retention of the Coal-Oil Mixture Program in the 1981 and 1982 Department of Energy budgets in sufficient amounts to permit the full-scale utility boiler testing of this technology in the next two-three year period. This COM Program, with its associated PON was included in the original 1981 budget at the level of \$22M, but has been unfortunately designated for a rescission of \$17.5M. This would be tantamount to aborting the development of this promising technology just at the time when the country and the utility industry vitally need the final but fundamental technical data which would be provided by this stage of testing, and technological development. Without this data, the hard decisions necessary for utility conversion to this alternate fuel cannot be made.

Over 500KBBL/day of foreign oil could be displaced in utility boilers if COM and other slurry technologies are applied. Reduced retrofit requirements necessary to apply this COM technology can effect displacement of this oil in the next 3-5 years with reduced strains on the credit markets and customer rate bases.

Our purpose today is to expose certain myths about COM technology in order to put into perspective the technological opportunity and the role that the federal government must consider in order to realize the shortest possible route to oil displacement.

Myth 1: It has been assumed that COM technology is at the point that a full technical data base for it's operational use has been developed and is available for use by the utility industry. The facts are otherwise. It must first be pointed out that COM is not just one fuel but rather a variety of fuels significantly characterized by the nature of different coals, various oil constituents and by whatever additives are needed for stability of the mixture. In reality, COMs represent only one family of alternative fuels, termed slurries, which involve some form of pulverized coal, some type of transport media that, like oil, may be combustible - or like water, may not be, and finally to the degree required - stabilizing chemicals.

In applying these slurries to large installations that are relied on for power, even more care must be exercised than would be necessary if one were to consider merely introducing one of these various coals into a boiler. Present information about these fuels has, in the main, been generated on small scale, non-utility size boiler facilities, and on limited tests only at full-scale (utility size) for a few COM fuels. The problem with these tests and their data is that:

1. It is not practical to project small scale test results obtained on the small boilers to full scale utility units.

2. It is impossible to predict with any degree of confidence, the impact of practical COM fuels on an oil-fired boiler from the restricted amount of data available from the few and limited test programs. Further, the boilers that were used are not representative of the large majority of oil-fired units around the country.

Represented in Figure 1 are the significant areas where operational difficulties may be encountered and for which scant data at full-scale exists. Any and all of these areas have the potential for serious, if not complete, curtailments of the unit's electric production.

a. Fuel Delivery and Storage System - None of the tests performed to date have addressed the full scale operational delivery and storage of large quantities of COM. Small scale tests have indicated promise, and have resulted in the development of stabilizers that appear effective but none of the COM material has been subjected to the full range of dynamic conditions encountered in utility operations.

b. Fuel Forwarding Systems - No basic design data exists on the engineering requirements of typical fuel forwarding systems involving pumps, piping, valves and metering devices when designing for COM fuel, either on a small or wide range for utility application.

c. Burner Systems - Although burner operations have successfully been performed, further development is necessary to establish the turndown, efficiency, and full performance characteristics of these burners in utility type swing load situations with a significant range of COM fuels.

d. Boiler System - Because of the different characteristics of each coal used in practical COM fuels, each COM has different tendencies to slag and foul a boiler. Knowledge about the character of each fuel in this regard is critical in operational situations since it affects the fuel economics, unit maintenance and realistic dependable rating of the generation capacity of the unit. The size of the boiler itself in large part determines the practicalities of applying different fuels because of the requirements for the combustion and heat transfer kinetics specific to each type of COM fuel. The key factor in displacing oil in oil designed units is providing an alternate fuel that can as nearly behave like oil while still providing effective heat transfer within the limited space available in an oil fired boiler without fouling the boiler, accelerating tube erosion or plugging the relatively small tube spacings in the various back passes of the units.

e. AQCS Systems - Air quality systems such as electrostatic precipitators and scrubbers, are extremely important in environmentally acceptable utility operations. They also impose an added burden on the utility in terms of integration with steam generator's safety controls. Their proper use requires their accommodation into operational production and maintenance schedules. How these large and vital pieces of equipment will be affected by the various COM applications has yet to be established by any test. This problem will not be resolved acceptably within the next five years unless there are adequate test evaluations in the DOE/COM program being requested for reconsideration here today.

In summary, there exists no sufficient body of the engineering and operational data necessary to effectively justify and successfully permit the conversion of existing operating utility oil fired electric generating units to alternate fuels like COM with confidence in maintaining a high level of reliability. The extent of system derating that will result from such conversions has also to be defined by technological development programs such as the DOE's

COM program DOE and EPRI recognize these problems and the need for their resolution.

Myth 2: The distinct impression has developed that existing tests and data or those projected in the near future will be sufficient to provide the data base identified as a requirement for commercial conversion. This does not happen to be true. The tests being conducted or currently projected, apart from the DOE/COM program for full scale tests, will not provide the necessary answers. In particular, the current status can be summarized as follows:

- a. The tests done at DOE/Pittsburgh Technology Center have all been small scale with limited COM types and while useful as such, are neither immediately extrapolatable to large utility boilers or comprehensive enough to cover the COM fuel options required by the utility industry.
- b. The DOE sponsored tests at Salem are being performed on a coal designed unit that formerly burned coal. It has provided some limited data on certain problems, but by no means can furnish the ability to extrapolate either from a variety of COM fuels or to various type boilers.
- c. The Crystal River Tests performed by Florida Power Corp. were done on a coal designed unit with only short duration times and no accommodation for AQCS or ash handling systems on an operational basis. The proposed conversion of Barto again provides no data for those strictly oil designed units which would enable reduction of the large oil fired capacities across the country. This unit should rather be considered as a full coal unit being limited to 50% replacement of oil, as against 100%.
- d. The testing at Florida Power & Light was performed on a unit designed conservatively for oil firing. It has a larger furnace volume than characteristic of conventional oil designed units. FP&L has decided after COM testing, to convert these units back to full pulverized coal operation after interim COM use. Their program, therefore, also will not and cannot generate the data needed by the majority of utility oil users who do not have the flexibility of either "looser" boiler designs or the space to convert to full coal. (Reference Figure 2)

In summary, none of the tests performed or projected in the next 3 years can provide the engineering data necessary for utility COM conversion decision making. This needed data can only be provided by the type of DOE/COM program presently being considered for rescission.

Myth 3 - It is generally believed that the Federal Government should not continue supporting the COM program since "it needs no further support for achieving commercialization."

From the previous facts, COM is certainly not a fully developed technology. To emphasize that point, contacts with utilities indicate that they consider the gap in engineering data cited above, as critical in their deliberations on alternative fuels. None of them are willing to risk replacing oil production capacity with COM. In addition, none of the COM suppliers or equipment manufacturers are in a position to guarantee the performance of their fuel or equipment when applied to utility practice. Anyone, including DOE if asked, cannot produce a list of COM suppliers or boiler and other associated equipment suppliers using COM who will provide warranties for their fuel or equipment performance. The data for doing this just does not exist at this time. If anyone has this data and the associated guarantees, we would be most pleased to see it documented for engineering and commercial implementation. To expect that this important data will be generated by the private utility industry is unrealistic. In the first place, the generating units are not available for such dedicated testing since they are normally required for meeting the system demands. Secondly, the industry, being in fact a regulated industry that

can only seek relief from increasing costs by pursuing rate increases. They can not expose their customers to the risk of capacity losses by undertaking conversions to COM without adequate engineering data. A single utility cannot be expected to individually undertake the test program required without federal support; especially since the results will provide data needed for the country at large. It should also be noted that additional alternate fuel technologies such as coal-water mixes could be tested, evaluated and compared on the same facility. This coal-water technology, which is now of interest to DOE, will require the same type of full scale tests before commercialization can be achieved. This coal-water technology is some number of years behind COM in development. It will also need to be calibrated to determine its operational impact on oil-fired boilers. This will be delayed for at least some 3-4 years unless the current program on COM proceeds. Three years from now, your same committee will be then faced with the consideration of support to a full-scale test of more expensive proportion and we would have, in the interim, lost the potential savings of oil achievable if COM technology had been applied. The findings of the SRC II and synthetic fuels programs are too far down the road. A systematic and active completion of the COM technology development, would be our earliest and most effective start for our country's energy independence. (Reference Figure 3)/

In conclusion, we reemphasize the following points for your consideration:

- COM is not a proven technology. It needs further technical development.
- COM is the only technology with the potential of displacing oil in oil-designed boilers within the next three years.
- Without an adequate data base, the widespread application of this COM technology and use by the utility industry will not occur.
- The government, because of its responsibility in research and technology development has a definite role to play. Replacement of foreign oil can most expeditiously begin within the next three years if the DOE/COM full scale test program is supported. Rescission of the funds allocated will be tantamount to abdicating this role. It should be of interest to this committee that Japan's Electric Power Development Corporation (government supported) has announced comprehensive testing plans on two major utility units. Is this another invasion of technology that because of the lack of our own efforts, we will have to buy from abroad?

We strongly recommend that the suggested rescission of FY81 funds for the DOE/COM program be defeated in the interest of reducing the stranglehold that oil prices have on our economy's inflation and the utility rate payers (your constituents).

FIGURE 1

PLANT PROCESS FLOW DIAGRAM

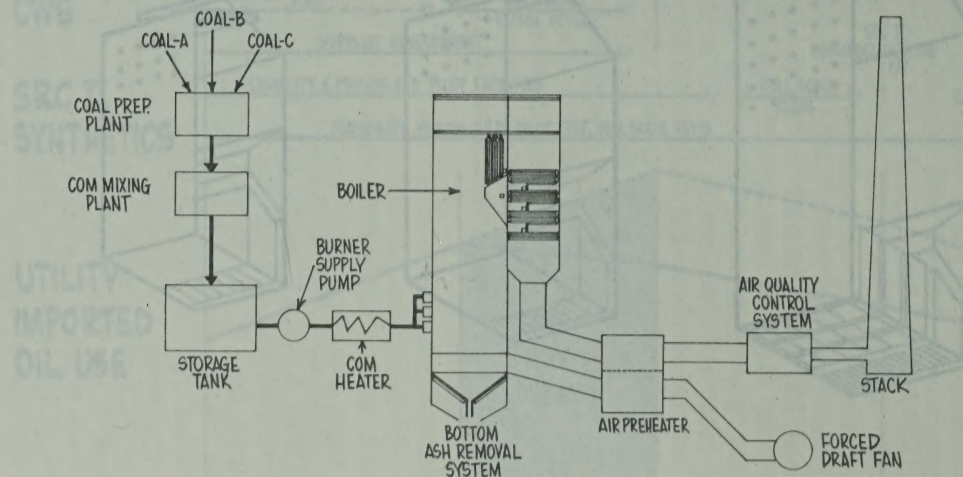
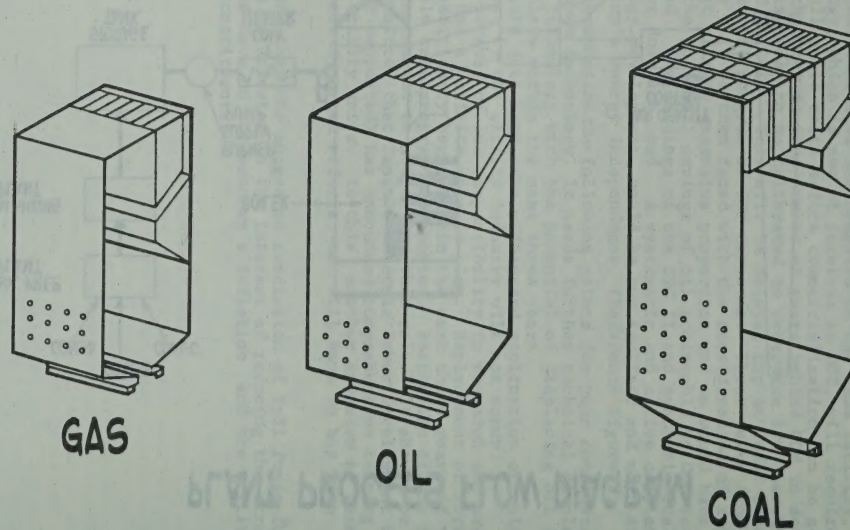
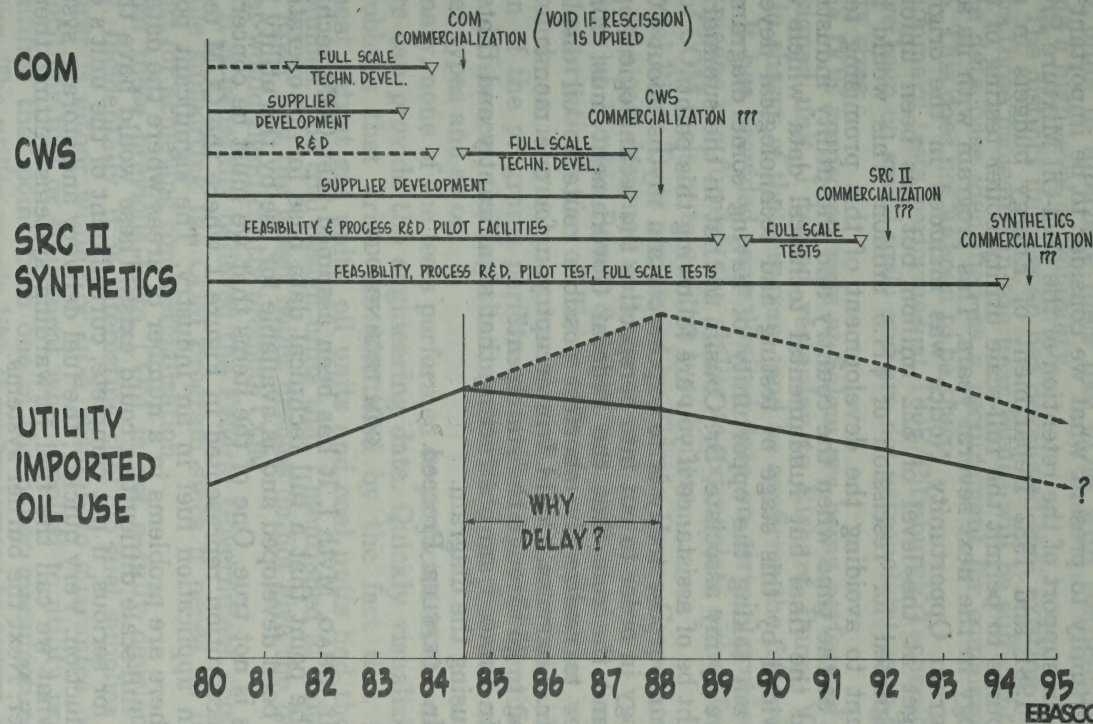


FIGURE 2

RELATIVE FURNACE VOLUME FOR VARIOUS BOILERS



OVERVIEW OF FEDERAL PROJECTED ENERGY PROGRAMS



Mr. CHAO. Good afternoon, gentlemen. We thank you for the opportunity to present what we consider to be important information in support of the retention of the Coal-Oil Mixture Program in the 1981 and 1982 Department of Energy budgets in sufficient amounts to permit the full-scale utility boiler testing of this technology in the next several years. This program with its associated Program Opportunity Notice was included in the original 1981 budget at the level of \$22 million but has been unfortunately designated for rescission of \$17.5 million. This would be tantamount to avoiding the development of this promising technology just at the time when the country and the utility industry vitally need the final but fundamental technical data which would be provided by this stage of testing and technological development.

I am taking the opportunity of having some diagrams posted there by my associate, Dr. Cousin, so that in the summarization it might be of assistance if you are following this point.

Our purpose today is to expose certain myths about COM technology in order to put into perspective the technological opportunity and the role that the Federal Government must consider in order to realize the shortest possible route to oil displacement.

Mr. LOEFFLER. Could I interrupt you for one moment. Are you going to go through the statement?

Mr. CHAO. I am abstracting that significantly and that is why I am using the diagram.

Mr. LOEFFLER. Proceed.

COM TECHNOLOGY

Mr. CHAO. Myth 1. It has been assumed that COM technology is at the point that a full technical data base for its operational use has been developed and is available for use by the utility industry. This is not true. One of the items that we must be concerned with is recognition represented in Figure 1 where the COM technology is an application fuel in an industry. The significant points are:

There are problems in a number of areas where the data is scant and full-scale difficulties could exist. These would have the potential for serious, if not complete, curtailment of the unit's electrical production. Very quickly, the fuel delivery and storage system next to what we call the fuel forwarding systems getting them to the boiler. Next the burner systems.

I will pause there. This morning a member of a major boiler company advised me that they would in no way guarantee the burners because there was insufficient data in this area.

Boiler system. Throughout the boiler in the furnace slagging areas in the back passes. It has to be remembered that the size of the boiler itself is in large part designed to requirements and specifics of each COM fuel. COM is not a fuel like number six oil. The "C" in any COM is either coal from Pennsylvania, coal from West Virginia, coal from Illinois, coal from Texas or coal from the West and each one of these coals has its own peculiar identification that can render serious problems in utility application.

Finally, we have the air quality control systems that have not had sufficient identification of factual utilization or effective performance.

In summary there exists no sufficient body of engineering and operational data necessary to effectively justify and successfully permit the conversion of existing operating utility oil-fired electric-

generating units to alternate fuels like COM with confidence in maintaining a high level of reliability.

Myth 2. The distinct impression has developed that existing tests and data or those projected in the near future will be sufficient to provide the data base identified as a requirement for commercial conversion. This does not happen to be true.

Quick summary tests performed at DOE/Pittsburgh Technology Center have been on small scale and are not extrapolative to the large utility sizes.

Next, the DOE sponsored tests at Salem are being performed on a coal designed unit. I talked yesterday to Richard Dunn, Vice President in charge of that program, and he confirms the following statement. It has provided some limited data on certain problems but by no means can furnish the ability to extrapolate either from a variety of COM fuels or to various type boilers.

The Crystal River Tests performed by Florida Power Corporation were done on a coal designed unit.

The testing at Florida Power & Light was performed on a unit designed conservatively for oil firing. We are very familiar with that inasmuch as it was an unusual unit. Dr. Cousin obtained verification of the programs performed in Florida with identification of the differences, the fact that on one Virginia coal was used with burner types and so on.

In summary, none of the tests performed or projected in the next three years can provide the engineering data. Quickly visualizing it, the problems that arise are identified by the fact that for common heat output gas units, oil units and coal units had those distinct volumes. The coal design units that I mentioned at Salem, at Crystal River and the looser boiler designs do not give the type of data that would significantly promote COM.

Myth 3. It is generally believed the Federal Government should not continue supporting the COM program since it needs no further support for achieving commercialization.

Now from these previous facts, COM is not a fully developed technology. Incidentally, it is interesting that no fuel supplier or manufacturer is either willing or in a position to guarantee performance of their fuel or equipment when applied to utility practice. I identified that point from one of the boiler manufacturers this morning. The utility people like their customers to accept the management of a technology that may come apart.

What we would also like to point out is that in the format of competition with other types of alternative fuels that there would be significant delays unless the current program on COM proceeds. For example, discussions have been made about cold water technology. However, that possesses and requires a research situation that already has been solved in a COM area.

Some three to four years from now your committee will be presented with evidence or testimony suggesting that the cold water program now be put to a full scale testing and identification of technological development. The SRC-II and the synthetic fuels program are too far down the road.

What would occur is that a systematic and active completion of the COM technology movement and development in the next two

to three years would be our earliest and most effective start for the country's energy program.

In summary, COM is not approving technology, it needs technical development. COM is the only technology with the potential of displacing oil in oil-designed boilers within the next three years. Without an adequate data base the widespread application of this COM technology and use by the utility industry cannot occur. The government, because of its responsibility in research and technology development has a definite role to play. Replacement of foreign oil can most expeditiously begin within the next three years if this DOE/COM full-scale test program is supported.

FISCAL YEAR 1981 RESCISSION

Rescission of the funds allocated would be tantamount to abdicate. I think it also would be of interest to this committee to know that Japan's Electric Power Development Corporation, government supported group and entity, has announced comprehensive testing plans on two major utility units. Is this going to be another invasion of technology that because of the lack of our own efforts we will have to buy from abroad?

We strongly recommend that the suggested rescission of fiscal year 1981 funds for the DOE/COM program be defeated in the interest of reducing the stranglehold that oil prices have on our economy's inflation and the utility rate payers, your constituents.

Thank you.

Mr. LOEFFLER. Thank you, Mr. Chao. I have no further questions.

Mr. CHAO. All right, sir.

COAL OIL PRODUCERS ASSOCIATION, INC.

DOE—FOSSIL ENERGY-COAL OIL MIXTURES

WITNESS

G. T. HAWKINS, PRESIDENT, COALQUID, INC.

Mr. LOEFFLER. Coal Oil Producers Association, Mr. Hawkins.

It looks like we may be able to finish the entire morning list of witnesses before we recess until this afternoon.

Mr. HAWKINS. I will do my best to cooperate. I thank you for taking the time.

Mr. LOEFFLER. Without objection, your prepared statement will be made a part of the record at this point.

Mr. HAWKINS. Thank you.

[Material follows:]

Statement of

G.T. HAWKINS

on behalf of the

COAL OIL PRODUCERS ASSOCIATION, INC.

before the

SUBCOMMITTEE ON INTERIOR APPROPRIATIONS

of the

HOUSE OF REPRESENTATIVES

Washington, D.C.

February 19, 1981

My name is G.T. Hawkins. I am President of Coaliquid, Inc. of Louisville, Kentucky, and am appearing this morning on behalf of the Coal Oil Producers Association, Inc. ("COPA") with regard to the proposed rescission of \$17.5 million from the Department of Energy ("DOE") budget for coal oil mixture technological development.

COPA is composed of eight companies which are current or prospective producers of coal oil mixtures. Members are developing processes to produce and maintain coal oil mixtures and to retrofit industrial and utility boilers with the capability to burn those mixtures.

I. Coal-Oil Mixtures

Coal oil mixtures or "COM" are boiler fuels which consist of pulverized coal and oil. In a typical mixture the ratio is 50/50. Under proper operational conditions, COM burns in a manner similar to No. 6 fuel oil (residual fuel) and thus can be used in utility and industrial oil-fired units. The capital cost of conversion of an oil-fired boiler to a COM is a fraction of the cost of converting such a boiler to coal, and the cost of the COM is 5% to 15% lower than the cost of residual fuel oil. Burner retrofit and emission control systems for COM conversion are far less complex and usually take a utility one to three years to implement; in contrast four to six years are necessary for coal conversion.

In addition, coal oil mixtures are stable products which can be stored, handled and transported in the same manner as oil. Thus, the processing plant need not be built at the utility or industrial site and production can be more centralized and economic.

The DOE believes that COM can be an extremely important near term means of reducing the use of oil in our utility and industrial boilers; it estimates that in any given unit approximately 50-65% of the oil now burned could be replaced by use of COM. The savings in petroleum consumption would represent approximately 350,000 b/d or 3.4% of the nation's daily oil imports; the savings could be increased to nearly 700,000 b/d or approximately 7% if a portion of the industrial heating facilities (not currently subject to the Fuel Use Act prohibitions against burning oil) could be retrofitted to burn COM.*/ In brief, use of this mixture can promote our nation's overall energy security by reducing our dependence on foreign oil.

*/ PON No. DE-PN22-80PC00015.S000. (November 14, 1979)
at 1 of Enclosure I.

II. DOE Technology Project

In November 1979, DOE issued a Program Opportunity Notice ("PON")*/ soliciting proposals from utility and industrial boiler operators for demonstration projects to collect data on coal oil mixtures burned in boilers now using oil. Three utilities responded to that PON, but only two actively pursued the project: the Cities of Lakeland and Jacksonville, Florida.**/ DOE has for the past year been reviewing both proposals and negotiating with both utilities. Shortly before final award of a contract was made by DOE, President Carter proposed that a portion of the funds appropriated -- \$17.5 million -- be rescinded.***/

The primary purpose of the DOE project would be to develop economic, environmental and technical information on the use of coal oil mixtures in retrofitted oil-fired burners. Such information is vital to the final development of this new technology. With appropriate data and analysis, user interest can be stimulated and coal oil mixtures can be used in the near term as an alternate fuel.

Moreover, under the terms of the PON the cost of the boiler retrofit, monitoring and data collection and analysis will be on a cost-sharing basis; private industry and the Government will divide the costs equally. Thus, financial assistance for this final step in the technological development of COM is not a Government subsidy but rather a one-time, limited amount of assistance restricted to Fiscal Year 1981 which will help to ensure industry's capability to burn this alternate fuel.

To date there has not been appropriate full scale testing of coal oil mixtures. Moreover, the various technologies used to develop coal oil mixtures differ in (1) the proportions of coal to oil, (2) techniques used to achieve stability in the mixture, and (3) qualities of coal; these differences will, of course, produce varying performance capabilities. The utility and industrial projects which will be funded under the PON are therefore essential to providing the firm data on cost, technology and performance needed to commercialize COM. In short, without DOE support the appropriate data base will not be established.

*/ PON No. DE-PN22-80PC00015.S000, (November 14, 1979).

**/ Long Island Lighting Company originally submitted a proposal in response to the PON, but later withdrew its application.

***/ 46 F.R. 6364, 6375 (January 21, 1981).

III. Proposed Budget Rescission

It is our understanding that the new Administration intends to withdraw Federal financial assistance from those energy technologies which are at an advanced stage of development and nearly ready for private sector application. This policy would restrict Federal funding to research on technologies which are many years from commercialization.

We see no public policy purpose in deleting COM demonstration funding. In fact, it is clear that the deletion will undercut the national objective of decreasing reliance on imported oil.

COM is almost ready for commercial application. If the funds appropriated for the DOE program are spent, use of COM as a fuel could become commonplace within two years. As indicated, COM will replace approximately 50% of the oil that would have been purchased for use in converted facilities. Thus the sooner the technology is put in commercial use, the greater the savings in oil.

However, if the COM program is abandoned at this time, commercial acceptance of this technology is likely to be set back by four years or perhaps more. In short, the Federal government investment should not move funds from technologies that are close to commercialization into far more speculative and uncertain technologies which are five, ten, or twenty years away. We should not lose the opportunity for reduction of foreign oil use now.

IV. Recommendation

As we have stated, coal-oil mixtures are a simple technology involving pulverized coal and oil. It is an economic, near-term and cost-effective means of reducing this nation's dependence upon foreign oil. A typical plant which will produce between 5,000 to 10,000 b/d can be built for \$2 to \$6 million; these plants can be built with existing proven equipment over a period of four to nine months. COPA believes that providing this money to the DOE will equip this infant industry with the necessary information to stimulate widespread consumer interest and use, and that such use will save this nation nearly 700,000 barrels of oil per day.*/ The investment is small; the benefit great. Accordingly, we ask that this money be obligated as originally planned in the budget for the fiscal year 1981.

Thank you very much.

*/ PON No. DE-PN22-80PC00015.S000. (November 14, 1979).

Mr. LOEFFLER. You may proceed.

OPENING REMARKS

Mr. HAWKINS. My name is G. T. Hawkins and I am President of a company called Coaliquid, Inc., a Kentucky firm. I am here today, however, representing the Coal Oil Producers Association which is a recently formed group of companies like ours that are engaged in the business of producing coal-oil mixtures, the fuels that Mr. Chao was just describing for you. It is not a new technology. The coal-oil mix has been around for about a hundred years but there never has been an economic incentive to consider the cost of oil and coal on a BTU basis which has been the same cost until the last seven years. We blend coal and oil together now.

My company and others in our group have been involved for the past several years testing coal-oil mixtures in industrial-sized boilers, blast furnaces and lime kilns. This is completely different from the utility oil design boiler. There is a substantial market and substantial savings to be made by replacing the residual oil that is going into oil designed utility boilers, specifically in the Northeast and the Southeast where the fuel rates are going out of sight because of these things. This is something that will not occur in the private sector.

The two specific utilities that are affected by this program, in that the utilities themselves are to be the recipients of this \$17.5 million, are in Jacksonville and Lakeland, Florida. Total generating capacity is oil and it is all imported oil. A substantial impact alone in those utilities cannot be made with necessary funding to bring them the coal-oil mixture. This does not go to the producer. I want to emphasize that. The producer will build his plant on private capital, will produce the fuel and sell the fuel on private capital. This money is going into the utility itself. It is a high risk industry and as Mr. Chao outlined before, people don't want to risk multimillion dollar investments on a new fuel. They have one responsibility, generating electricity for their community, and they are not advocating that without burn data. That is what this program would provide.

Mr. LOEFFLER. The taxpayers, so there is a risk. The risk of being accepted by the same individual one way or the other?

Mr. HAWKINS. No, the risk would be to the first who went on line. The risk is going to be shared by all of us, and all of us will receive the benefit from the reduced imported foreign oil. By the Department of Energy's own estimate the utilities and industries that could come off of oil and go to COM would take 700,000 barrels per day of imported oil requirements out of our replacement fuel so we are sharing that risk nationwide for the first demonstration program.

Most of the industrial work, with the exception of the Pittsburgh Technology Center which is ongoing, has all been privately financed, every bit of it, but there is a lower risk involved there and more economic incentive to move forward because the steam generation requirement in industrial application is much less than to a utility where everything hinges on steam generation. So the big push has got to be to get into the utility market where the greatest impact can be made. This cannot go forward without this kind of demonstration effort.

This Program Opportunity Notice that the funding is for, which is in question, was released in November of 1979 and it has been under consideration since that point with decisions nearly being made and now at the last moment it is pulled away from us. Coal-oil mixtures will come but we are delaying the impact by four to five years without this kind of testing program. Testing is probably not a fair description. We are talking here about truly developing a technology. This is something that is not appropriate for the Synthetic Fuels Corporation which might be the first reaction, why can't it go to the SFC.

This is not a project for producers of alternate fuel, it is a technology development for the user of an alternate fuel and we really firmly believe that it should be the place in an association like ours. An industry like ours can have its total impact on the market and do the job we all want done but just take some of the dependence on foreign oil away.

I have nothing further to say.

Mr. LOEFFLER. You mentioned a five year delay. In the event that, for instance, the rescissions would go forward in five years, who would accept the burdens and responsibilities of the delay as opposed to those who accept them now? If there is a five year delay at this point, do you have someone who is going to assume that financial responsibility? Who are those people?

Mr. HAWKINS. They are going to come from the same people who will benefit today, the difference being if I go back to my premise the coal-oil mixture comes from the cost difference. At the beginning of 1970, the last decade, the cost of coal and oil on a BTU basis was just the same; it was not until 1973 the difference started to arise. The economics come up in the middle. You are looking at a residual oil market today. Coal is still \$2. As that spread gets ever larger, somewhere in between those two becomes more apparent. Right now we are on the borderline, we have just crossed over into where economics has started to take over. There is a financial incentive to make a commitment here but the return on today's dollars is not sufficient to make that push particularly when in the utility market. Their returns are quite large because of the cost of capital particularly but in years to come that is going to be there because that spread is going to continue to be larger, there is no question about it at this time.

Mr. LOEFFLER. Thank you.

I see there are no additional witnesses on our agenda for this morning.

The committee will stand in recess until 1:40 p.m. in deference to the National Federation of Federal Employees. The 1:30 p.m. witness has cancelled so we will convene promptly at 1:40 p.m.

Have a good lunch.

AFTER RECESS

Mr. LOEFFLER [presiding]. The subcommittee will come to order.

We will continue the hearing we began this morning. Recognizing that the witnesses scheduled to testify at 1:40 p.m. are not presently available in the room, we will proceed with the Sierra Club, Brooks Yeager.

SIERRA CLUB

DOE CONSERVATION PROGRAMS

WITNESS

BROOKS YEAGER REPRESENTING THE SIERRA CLUB

Mr. LOEFFLER. Without objection, your prepared statement will appear in the record at this point and you may proceed as you wish.

[Material follows:]



by Ansel Adams in *This is the American Earth*

SIERRA CLUB

330 Pennsylvania Avenue, S.E.
Washington, D.C. 20003
(202) 547-1141

TESTIMONY OF THE SIERRA CLUB

BEFORE THE

HOUSE APPROPRIATIONS SUBCOMMITTEE ON INTERIOR

CONCERNING THE PROPOSED DEPARTMENT OF ENERGY BUDGET

FOR FY 1982

February 19, 1981

Mr. Chairman, Members of the Committee,

My name is Brooks Yeager. I represent the Sierra Club, an organization of more than 188,000 members nation-wide.⁴ I am grateful for this opportunity to present our views on the proposed budget for the Department of Energy for FY 1982, and on the accompanying reductions in both FY '81 and '82 budgets proposed by the new Administration.

Our members are extremely concerned about the economic predicament in which our nation currently finds itself, and about the energy problems which we will be facing this year and in the years to come. I think it is fair to say that we are no happier than anyone else about the inflationary state of the economy. We recognize the overriding need to cut the federal budget as a start of a national effort to combat inflation, and we are willing to bear our share of the costs of such budget reduction. We also recognize an equally important need to chart an energy course which will end our dependence on foreign oil and allow room for economic growth in the future.

In addition, our members are very conscious of the link between the sorry state of our economy and the emerging energy crisis which we face. Rising energy prices are a major spur to inflation. We are very concerned with government policies which continue to ignore the most cost-effective and environmentally acceptable solutions to our energy problems, while using

Have a good lunch.

Mr. Lott (presiding) The subcommittee will come to order.

billions of dollars of taxpayers' money to subsidize exotic, unproven, and environmentally questionable modes of energy production.

There is little question in my mind that the DOE budget can be cut, and cut significantly, without long-term harm to our nation's energy capability. Our energy programs are currently suffering from the same kinds of myths and problems which burden the national budget: an addiction to exotic, expensive solutions to problems which could be addressed more cost-effectively, a surfeit of programs which benefit contractors and pet industries, while doing little to resolve our energy problems, and a belief that bigger, higher technology solutions must be better.

According to a recently released study, this nation's taxpayers have already subsidized the development of commercial nuclear power in this country to the tune of \$37 billion. The proposed budget figures in the DOE request for fiscal 1982 would add more than \$4 billion to that ongoing subsidy. Over \$1 billion of this additional subsidy will be assigned to technologies which are speculative and have no clear date in which they will be scheduled to be producing electrical power on a commercial basis. This includes over \$500 million for magnetic fusion technology, \$459 million for Breeder programs, and \$45 million for advanced nuclear systems.

Truly beneficial cuts, which would leave us with a more effective mix of energy programs in DOE, are possible. Such cuts should be equitable, and they should be carefully targeted so as to enhance the cost-effectiveness of DOE's total efforts. Programs which get a poor return on the dollar should be cut before programs that get a good return; projects whose outcome is far in the future or uncertain should be cut before projects with immediate and certain results; programs which produce little in the way of accompanying private investment should be cut before programs which produce high returns in the private sector; efforts where federal involvement is non-essential should be cut before efforts where federal involvement will produce measurable benefits; and finally, programs which do not form an integral part of a coherent national energy policy should be cut before those which do.

In our view, the cuts proposed by OMB in the energy conservation program are neither equitable, cost-effective, nor wise. Rather than embodying a rational and well-thought-out response to the energy problems we face, these

cuts are an ill-disguised attempt to repeal or substantially weaken major portions of the national energy strategy enacted by Congress over the last four years. At the same time, the OMB package will leave untouched many of the exotic and expensive programs which have long been a DOE hallmark, and accelerate the policy of subsidies for high technology projects whose energy production potential is at best doubtful.

It is apparent that this Administration thinks that conservation of energy is the equivalent of curtailment. The President has already been quoted as describing conservation as "when you're too cold in the wintertime and too hot in the summer." Fortunately for all of us, that is not the case at all. Almost every major national energy study conducted over the last decade has concluded that the United States could save between 30% and 40% of its total energy consumption without altering the pattern of end uses or substantially changing the lifestyle of its citizens. Such savings would come through increasing energy productivity or efficiency. In line with OMB's expressed objective of freeing capital investment funds in the private sector, these conservation measures would save over \$430 billion in energy-related capital investments over the next 25 years.

The cuts proposed by OMB barely touch DOE's enormous nuclear subsidy program. They are aimed primarily at DOE's conservation budget. Using the unsubstantiated justification that rising oil and gas prices will "take care of" our conservation needs, OMB is proposing a budget strategy which flies in the face of every major national energy planning study of the last five years. Perhaps this is a good time to recall the conclusion reached by the National Research Council in its CONAES Final Report:

All in all, conservation deserves the highest immediate priority in energy planning. In general, throughout the economy it is now a better investment to save a BTU than to produce one. (p. 4)

That report, echoed by the other major recent studies including the famous Harvard Business School Report, also concluded that the major barriers to progress in energy conservation were not technical, but political, institutional, and economic--the very types of barriers which the federal government is best able to resolve.

The United States currently lags far behind other free world nations in energy efficiency. In Sweden, where the population enjoys a standard of living which is comparable to that of Americans, the per capita consumption of energy is only about 60% of what it is here. The OMB budget would insure that this gap remains as startling in the future as it is today.

Despite Mr. Stockman's blithe assurances, market response to rising energy prices has not yet, and is not likely to provide the United States with a coherent and effective energy conservation program. Federal involvement is badly needed to encourage the development of standards for energy efficiency, to inform citizens and businesses of the conservation opportunities which exist, and to help state and local governments, businesses, and individual citizens to overcome the initial cost hurdle for conservation investments. Although it is arguable that they do not go nearly far enough in addressing such problems, the current range of DOE conservation programs, almost all of which have been put in place by a concerned Congress over the last five years, do represent a good beginning. The OMB proposed cut would destroy many of these programs outright, while leaving others to "twist slowly, slowly in the wind."

Although I have not had the time or opportunity to make an exhaustive analysis of the cuts, there are plenty of examples of the wrong-headedness of OMB's proposals:

- * OMB is asking you to eliminate all funding for development and implementation of building and appliance standards, as well as for DOE's residential conservation services. These cuts would essentially repeal important parts of the Energy Policy and Conservation Act, passed in the 94th Congress, the National Energy Conservation Policy Act, passed by the 95th Congress, and the Energy Security Act, passed by the 96th Congress. They would gut a program which has produced energy savings of more than 6.5 million barrels of oil equivalent (MBOE) to date, and whose projected accumulated savings in the year 2000 are over 12,900 MBOE, or six years worth of oil imports, at the current rate.

- * OMB is asking you to eliminate much of the funding for DOE's programs in cost-shared industrial conservation research and development. These

programs, which were authorized by Titles IV and V of the National Energy Conservation Policy Act, have a projected energy savings of one quad annually in the near-term, and 5.5 quads (990 MOBE) by the year 2000, a savings which would represent nearly 15% of our current annual consumption of petroleum.

* OMB would also have you eliminate the major portion of DOE's research and development and financial assistance programs in the areas of deriving energy from municipal and commercial waste. This program, which was authorized by the Energy Security Act of 1980, embodies projected energy savings of 250,000 barrels of oil per day by 1992, which amounts to 12% of our national synfuels goal at that same date.

* OMB would like you to eliminate the funding for state conservation programs. This program, authorized by the Energy Conservation and Production Act of 1976, and the Energy Extension Service Program, have already saved the nation the equivalent of 100 trillion BTU's of energy, according to official estimates. Many state energy conservation programs rely for their effectiveness on the information and support provided by DOE through these programs.

These examples should indicate the drift of OMB's proposed energy policy. Our reasons for opposing such a policy are clear. It would tend to intensify DOE's traditional reliance on exotic technology and centralized production programs. The time is long past when we could safely put all our eggs in such a basket. It would tend to cut programs whose cost-effectiveness is high, whose potential energy savings are very great indeed, and whose environmental consequences are positively beneficial. This is an energy strategy which would subsidize the Edsel and ban the bicycle. It is a policy which would reverse the most carefully thought-out Congressional initiatives of the last four years, and ignore the real opportunities which this nation has to resolve its energy dilemma.

I would ask the Committee's permission to submit more detailed recommendations concerning the portions of the DOE Budget under this Subcommittee's jurisdiction at a later time.

For now, the recommendations of the Sierra Club are:

-that the Subcommittee should look very carefully at the cost-effectiveness and at the projected energy savings of each of these programs before agreeing to the blanket reductions proposed by OMB. Such a review could be conducted independently, or as part of the upcoming review of National Energy Policy.

-that the Subcommittee should consider stretching out long-term R&D programs in magnetic fusion, fission technology, and advanced nuclear systems, thus creating savings which would offset any conservation appropriations which the Subcommittee sees fit to retain above the amounts recommended by OMB.

-that the Subcommittee should resist this precipitous move to dismantle the major energy conservation programs which have been put together so carefully by Congress over the last five years.

SUMMARY OF STATEMENT

Mr. YEAGER. Summarizing our point of view with regard to the budget statements that have been made recently on the DOE budget, our concerns are that our more than 188,000 members across the country recognize the overriding need to cut the Federal budget and cut waste. I think our members are no happier than anyone else about the economic condition of the country right now. Many of them voted for President Reagan, I am sure.

On the other hand, our members recognize that our problems are not only economic but we have an energy problem that was severe in the past and likely will be severe again. We think that the energy crisis that we face is the prime cause of our economic difficulties right now and therefore we think that in reviewing budget recommendations which touch on essential Federal energy programs that we need to look at them from both the point of view of how they affect the Federal budget and also the point of view of how they affect our ability to save, conserve and produce energy in the next decade and the next decade after that.

We think in particular that the Department of Energy is vulnerable in the popular notion of cuts because it has focused so much attention on exotic and expensive nonproductive technology over the past years and because of that track record it is a good target for budget cutters in the administration. One of the things that struck us most about Mr. Stockman's early statements with regard to his OMB budget cutting direction was the need to resolve a private capital crisis in the United States. We think that that crisis is intimately related to the pattern of energy investments which the United States is making and particularly we think that continuing to put billions and billions of dollars into subsidies for technologies which may or may not produce commercial energy at some point far in the future tends to exacerbate the capital crisis that Mr. Hawkins talked about whereas putting Federal money into programs that offer a certain return in the immediate future and that will allow the United States to forego capital intensive energy investments in the future is a good idea and it is a way to help resolve that kind of a crisis.

One example of traditional DOE thinking in that regard is the size of the subsidy that we now have for nuclear programs and all sorts of other programs but commercially valuable. It is not DOE/Defense programs since the formation of the Atomic Energy Commission is approximately \$37 billion. That is a large chunk of money and in comparison with that OMB is now proposing to cut the heart out of conservation programs recently enacted by Congress that on the face of them we will expend only a billion dollars in the next year.

We think that cuts can be made effectively in the Department of Energy budget and we think that those cuts can leave the Department of Energy budget leaner but we think the criteria for those cuts have to be based very fairly on the ground of cost effectiveness.

Mr. LOEFFLER. What specific programs would you cut to reduce the size of the Federal expenditure or perhaps terminate in lieu of what we are considering today?

Mr. YEAGER. I can answer that best by giving what kind of criterion we think is important and then moving into particular program areas.

Mr. LOEFFLER. All right.

Mr. YEAGER. We think first of all the cost effectiveness of the programs; that is, how many dollars of Federal money would actually be expended and what kind of return are we getting and how fast are we getting the return. The energy crisis is not a crisis that we are going to be facing in the year 2050, it is a crisis that we face right now, it is a crisis that impinges on us with the possibility of oil cutoffs at any time in the future.

We think that a program whose outcome is far in the future, therefore, could be stretched out in favor of programs that will produce immediate energy savings and in that respect we think that the programs for long-term R&D for things like magnetic fusion, fission technology or advanced nuclear systems could effectively be stretched out without damaging them so that we could still retain money for which we are capable of producing real energy for the United States over the next five years.

We think that programs where the Federal role is essential or programs where the Federal role is clearly a need in a private marketplace should be favored over programs where there is no need for the Federal role and in that respect we disagree with Mr. Stockman. We think that a Federal role in the setting of conservation standards and in helping individuals and businesses and local governments and State governments overcome the cost hurdles and the information hurdles to get going on real conservation programs. We think those kinds of Federal goals are very valuable and we think that they should be continued.

We think that in terms of the actual conservation programs that if anything were to be cut it should be the technology R&D programs because it is our opinion that in conservation programs the technology exists now. In other words, there certainly are technological savings that could be made in industrial conservation in the future but the fact is that every major national energy study that has been independently produced over the last five years has indicated that conservation in fact can save this country 30 to 40 percent of its energy usage. That is by the year 2000 and that is by producing the equivalent of that amount of oil and it comes at much less expense.

We think it would be very damaging for the subcommittee to accept, without extensive investigation, the kinds of conservation cuts that are proposed by Mr. Stockman because we think that those are directed at the most effective conservation programs and the ones where the Federal role is the most necessary. Those include the maintenance of and implementation of information standards for appliances, for automobiles and for buildings and they include the State grant programs which many State energy offices depend on.

I had a conversation with people from the Oregon State Energy Office three weeks ago in which they told me it would be a very severe blow to their conservation efforts in Oregon if that State grant program was going to be cut. You say give them a block grant knowing that one of the prime institutional obstacles to

energy conservation is the fact that you have to make a capital investment now but you only receive the payoff on it over an increment of five or ten years in the future. That is true for State government, too; it is very hard for them to allocate as much money from a block program for conservation when they have people clamoring for the various kinds of funding necessary which you are already looking at in the subcommittee.

We think the Federal role there is very important and we think that in fact \$1 billion, or \$900 million to be more exact, of the Energy Department's budget is a relatively modest amount to spend on these kinds of programs that could save us the equivalent of six years of oil imports by the year 2000. That is the energy projection that is made for their program. That is like producing oil.

We think that the new administration is making a very damaging mistake if they think that conservation is just curtailment of end use of energy. That is not what conservation is. Conservation is increasing the energy efficiency so that we can have the same end uses but save oil and save energy and it is clear that that is a possibility. The Harvard Energy Study says that Americans need not change their life styles by any significant amount in order to save 30 percent of the energy that we now use but there are clear market sector areas where Federal help is needed in retrofitting old housing.

It is impossible to get the kind of energy savings that we could get just by focusing on a new building. We have to have programs that go in and help the housing industry retrofit its old buildings. I think the kinds of cuts that the new administration has proposed are also mistaken from the point of view that they essentially repealed important parts of the coordinated energy package that was passed by Congress over the last five years.

Mr. LOEFFLER. Let me ask you a question about the State energy grant programs. How do they increase energy efficiency?

Mr. YEAGER. Well, Oregon's program is one that I can talk about with some knowledge as essentially an informational program. They help train energy auditors. They work with utilities to increase the amount of information that utilities give their customers about what their savings can be. They work at the State level to increase the energy savings in the plant.

Mr. LOEFFLER. What has been the energy savings as a result of that?

Mr. YEAGER. I do not have a figure for it. I can try to get some State figures for you.

Mr. LOEFFLER. Would you, please, and submit them for the record.

Mr. YEAGER. Yes, I will.

[COMMITTEE NOTE.—No additional materials provided.]

Mr. YEAGER. I guess my conclusion would be, and I think the Sierra Club's recommendation to the subcommittee would be that this is not just a budget matter, this is something that we should take a look at what program is being proposed in terms of these cuts. Particularly we would hope that the subcommittee would look at the cost effectiveness of the various programs and would not make a blanket judgment on conservation and would not accept as

a blanket judgment the judgment that has been made by OMB that conservation programs are no longer needed at the Federal level. We suggest that that is not true and that every major energy study that we know of suggests that that is not true and that these are very valuable.

We would hope that the subcommittee's National Energy Policy Review could be made part of the record, if possible. Other than that, we place our trust in the good judgment of the subcommittee.

Mr. LOEFFLER. Thank you. We will pursue some of those initiatives very seriously.

Mr. YEAGER. Thank you.

COMCO

DOE—FOSSIL ENERGY-COAL OIL MIXTURES

WITNESSES

LASZLO PASZTOR, MANAGER OF FEDERAL AFFAIRS FOR DRAVO CORP.

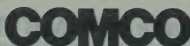
RICHARD QUICK

Mr. LOEFFLER. Still being ahead of schedule, the Chair is pleased to call the witness from COMCO, Mr. Laszlo Pasztor.

Mr. PASZTOR. Mr. Chairman, I am Laszlo Pasztor, Manager of Federal Affairs for Dravo Corporation. I am accompanied by Mr. Richard Quick.

Mr. LOEFFLER. Without objection, your prepared statement will appear in the record at this point and you may proceed as you wish.

[Material follows:]



Specialists in
composite fuels

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Coal-Oil Composite Fuels:

A Feasible Approach to Near-Term Reduction of Residual Oil

Prepared For: Hearings on the DOE Budget by the Interior Subcommittee
of the House Committee on Appropriations
February 19, 1981, Washington, D.C.

Submitted For: Testimony and Inclusion in the Hearing Records

Prepared By: Jon Wilda
Manager, Marketing
COMCO

Introduction

I am Laszlo Pasztor, Manager of Federal Affairs for Dravo Corporation.
Dravo Corporation is one of the three partners in COMCO.

COMCO is a company combining the skills of three diverse organizations:

A leading engineer-constructor - Dravo Corporation

A large electrical utility - Florida Power Corporation

A major energy supplier - A. T. Massey Coal Co., Inc.

COMCO was formed for the express purpose of developing and commercializing various types of composite fuels. COMCO's primary business interest is selling composite fuels or processing services from plants owned and operated by COMCO. COMCO does not rely on a single technology for composite fuel preparation but rather a broad technical base which can be focused to serve all aspects of a customer's fuel conversion requirements.

Importance of Support for DOE Coal-Oil Mixture Demonstration at City of Lakeland, Florida

The DOE issued a solicitation (PON DE-PN-22-80PC-0015) for utility participation in a comprehensive, full-scale test of coal-oil mixture (COM) combustion in an oil-designed boiler. This program is considered by some as unnecessary, in view of the current budget-cutting climate, and a rescission order was issued, which was subsequently changed to a deferral. In fact, this test is most important in achieving the potential for near-term substitution of coal-oil mixtures for residual fuels by utilities.

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The City of Lakeland, Florida, responded with a unit which is technically representative of a broad segment of oil-designed units in the U.S. The results of the test on the Lakeland unit would be welcomed by utilities, as evidenced by the fact that ten other utilities volunteered to form an advisory team in order to be close to the City of Lakeland's test.

Need for Coal-Oil Mixture Demonstration

Although there is considerable interest among potential COM users, they are not yet convinced that COM will work in their particular boilers. Several COM programs have been initiated by the Department of Energy. In one program a small industrial boiler was fired with COM. Such a boiler is not deemed by utility personnel to be sufficiently representative. Another program, by New England Power Service Company, sought to test up to 30% coal content in a COM. That NEPSCO test was performed in a coal-designed unit and has minimal application to the 60,000 MW of oil-designed boilers. Essentially, both programs produced results which, while interesting for the specific equipment, are inconclusive for most large utility-sized units.

A more recent program, by Florida Power & Light, demonstrated the technical feasibility of firing COM. FP&L has apparently decided not to commercially convert to COM until it has evaluated other options, but they have acknowledged COM firing to be economically competitive with oil firing. While the FP&L boiler has never fired coal previously, its design is essentially that of a coal-designed unit in contrast to the City of Lakeland's oil-designed unit. COMCO considers the City of Lakeland unit to be most representative of the 60,000 MW of installed oil-designed capacity in the country.

As you may be aware, COMCO is building a commercial COM preparation plant in Tampa Bay. By the end of this year we will be supplying by tank barge a 50% coal-50% oil COM on a five-year, 600,000 barrels per year contract to Florida Power Corporation's Bartow Unit 1. However, here again, this is a boiler which, while never fired with coal, is definitely coal designed.

COMCO wishes to reaffirm that the DOE proposed demonstration at the City of Lakeland's oil-designed unit is a particularly relevant program and a most appropriate application of government funds.

How Applicable are Coal-Oil Mixtures Today?

COM is much nearer to becoming a practical alternative fuel than the synthetic fuels which still require billions of dollars in research and capital expenditure.

COM has the potential for near-term reduction of over 500,000 barrels of oil per day in utility boilers. Industrial and marine substitution of residual oil by COM represents an additional 100,000 barrels per day of potential oil savings.

There is another possibility to save another 100,000 barrels of oil if we are able to demonstrate and get coal-oil mixtures used by the industrial sector and also by the marine industry to replace just the use of oil. These are the reasons we feel the Government could fund and support such a demonstration as Lakeland is proposing.

Coincidentally, there are ten major companies who formed an advisory board just to be able to stay close to the demonstration and to see how it is going to go. There may be some problems with

COMCO

The Economic Regulatory Administration in its March 1, 1980 Annual Report vividly portrays its problems in implementing prohibition orders to utilities. COM has the capability of quickly reducing oil consumption with capital expenditures significantly less than full coal conversion.

COM can be prepared, delivered, and burned at less than the current price of residual oil.

Significance of Composite Fuel Development

The capital and operating savings associated with coal-oil mixtures will be realized and enhanced by further demonstration programs. No experience with coal-oil mixtures on oil-designed units has occurred yet, even though there is again 60,000 MW of oil-designed capacity, that is impractical to convert to conventional direct coal firing. DOE officials readily admit, privately, that coal-oil mixtures were left up in the air by the unexpected rescission/ deferral.

Thus, the City of Lakeland demonstration is important. Important not only to coal-oil mixture use but the just emerging field of coal-water mixtures. Coal-water mixtures totally eliminate the residual oil component of a coal-oil mixture.

We must have the results of the City of Lakeland's coal-oil mixture demonstration in order to know how to best proceed with coal-water mixtures. It should be noted that the City of Lakeland, on its own, has proposed incorporating a coal-water mixture test as an expanded scope of the original coal-oil mixture program.

Coal-oil mixture use is therefore both a cost savings step in itself and an excellent preparation for an accelerated coal-water mixture program.

Thank you for your attention.

I would be happy to answer any questions.

Mr. PASZTOR. COMCO is a company combining the skills of three diverse organizations: Dravo Corporation, a leading engineer-constructor; Florida Power Corporation, a large electrical utility; and A. T. Massey Coal Co., Inc., a major energy supplier.

COMCO was formed for the express purpose of developing and commercializing various types of composite fuels. COMCO's primary business interest is selling composite fuels or processing services from plants owned and operated by COMCO. COMCO does not rely on a single technology for composite fuel preparation but rather a broad technical base which can be focused to serve all aspects of a customer's fuel conversion requirements.

The reason we are testifying today is because we feel that the coal-oil mixtures commonly referred to as COM represent a feasible approach to near-term reduction in the use of residual oil. We feel that the committee and the Congress should support demonstration of this technology that was used as long ago as the Second World War both here in the United States and also overseas. However, with improvements in technologies our new technologies are available in the culmination of coal obtaining small particle size and to obtain more stable coal-oil mixtures.

Mr. LOEFFLER. Why would the private sector not be able to carry this load on its own?

Mr. PASZTOR. The reason is that while many power companies and several industries are enthused in the use of using coal-oil mixtures, unfortunately there is still some uncertainty how this technology can be used in coal-designed power plants. The coal-oil mixtures, and we are talking here of up to 50 percent coal and 40 percent BTU replacement of oil, were tested in small units, for instance, at the Technology Center and also by the New England Power Service Company. On the last scale we still have several unknowns and that is the reason why we would be in favor of support of the 40 percent for the Lakeland demonstration project which was actually DOE solicitation PON DE-PN-22-80PC-0015. Unfortunately, there was a rescission on the Lakeland order concerning this demonstration.

We feel that if such demonstration would take place it would demonstrate to the power generating industry and to the other potential industrial users of coal-oil mixture that it is reasonable and relatively safe to invest in the use of coal-oil mixtures. There is roughly a 60,000 megawatt capacity in the United States where we could use coal-oil mixtures within a very short period of time. This could lead just in connection with the power generating sector to a saving of roughly 500,000 barrels of oil per day. This is based on information that came from various DOE sources and it is also the opinion of the private sector that this is a very reasonable goal to achieve.

There is another possibility to save another 100,000 barrels of oil if we are able to demonstrate and get coal-oil mixtures used by the industrial factor and also by the marine industry to replace just the use of oil. These are the reasons we feel the Government could fund and support such a demonstration as Lakeland is proposing.

Coincidentally, there are ten major companies who formed an advisory board just to be able to stay close to the demonstration and to see how it is going to go. There may be some problems with

slagging. There may be some problem with the disposal of slag because in all you have very little solid residues but adding the 50 percent weight of coal there are still some unknowns of what will happen. There were several successful demonstrations, one of them in connection with the Dravo Corporation where we have used large quantities on a continuing basis and we know that it can be but the previous demonstrations were mainly in coal-designed facilities where you have some facilities for the disposal of slag.

We feel that demonstration which is large enough, not like the Technology Center which was only a 7100 horsepower type of demonstration or the New England Power Service Company which was also relatively small—if you could demonstrate this on a large scale, it would convince both the power generating industry and the steel industry and other industries that this is a very feasible way to replace oil and gas imported oil. That is the way that we feel.

Coincidentally, the use of coal-oil mixture is economic, it seems to be economically feasible, but we have to try to eliminate these uncertainties which are holding back the companies who invest in building the coal-oil mixture plants and who use coal-oil mixtures. These are the grounds I wanted to cover.

Mr. LOEFFLER. Assuming that the money would not be available, what would be the impact on the use of coal-oil? Would there be a delay of one year?

Mr. PASZTOR. I am afraid that it may be delayed even more. I am familiar with the DOE study concerning two technologies and that timetable calls for the first completed report by January of next year so this means that the Government through the energy regulatory agency will have a report out but I think that the demonstration would be a much more significant resistance to the use of coal-oil mixture because the users may think that the risk is just too high but if there is going to be a successful determination I think it would be much more easy.

Mr. LOEFFLER. How much private sector participation is there in this effort?

Mr. PASZTOR. Thus far we are involved only in private sector activity. We financed our own research and now this activity is financed and also demonstrations with our two partners with Florida Power Coal Company. Thus far there are millions of dollars invested by partners on this project and there are several other corporations who did the same thing but the demonstrations for that short period or as I mentioned the Government supported demonstrations for small units, 700 horsepower and the New England Power demonstration was also a relatively small demonstration. That is the reason why we feel it should be an oil-designed unit and that is the key, that you have to demonstrate in an oil-designed unit that you can use it. That has a 60,000 megawatt capacity as I mentioned before and that would lead to roughly 500,000 barrels of oil. Let me say the steel industry has interest in using coal finds and oil finds and coke finds or petroleum finds in combination with oil or maybe even in water. That would lead to a very significant increase in coal-oil mixtures.

We feel that the advantages of the coal-oil mixtures are the following:

It is actually competitive with oil, we can produce it at a very reasonable cost.

It requires a very low capital investment and that is also very important.

We need a very short lead time. If there is a green light so the people can go ahead, it does not require any transportation infrastructure because we can use transportation facilities.

It has a flexibility to switch back from coal-oil mixtures to oil if it is necessary—for instance, peak performance in the same plant—because the efficiency may be five to ten percent depending on what type of coal-oil we used and it is very easy to make it acceptable.

So these are the reasons that we feel the Congress should support such a demonstration.

Mr. LOEFFLER. Mr. Quick, do you have anything to add to that?

Mr. QUICK. No. Thank you, Mr. Chairman.

Mr. LOEFFLER. Thank you.

Mr. PASZTOR. Thank you very much.

ENERGY CONVERSION GROUP

DOE—ENERGY CONVERSION

WITNESSES

JERRY M. BRADY, ENERGY CONVERSION GROUP

GRANVILLE SMITH, PHYSICIST AND VICE PRESIDENT OF ENERGENICS
SYSTEMS AND CONSULTANT TO THE ENERGY CONVERSION GROUP

WALTER SYNIUTA, PRESIDENT, ADVANCED MECHANICAL TECHNOLOGY

PETE SMITH

Mr. LOEFFLER. Energy Conversion Group, Mr. Brady.

Mr. BRADY. I am Jerry Brady and this is Dr. Walter Syniuta and Dr. Pete Smith who is the Vice President of his own company specializing in energy systems.

Mr. LOEFFLER. Mr. Brady, your statement will appear in total in the record at this point.

Mr. BRADY. Thank you.

[Material follows:]

STATEMENT OF THE ENERGY CONVERSION GROUP
 BY JERRY M. BRADY
 BEFORE THE SUBCOMMITTEE ON INTERIOR APPROPRIATIONS
 HOUSE APPROPRIATIONS COMMITTEE
 February 19, 1981

Mr. Chairman, my name is Jerry Brady and I appear on behalf of the Energy Conversion Group. With me is Dr. Granville Smith, a physicist, Vice President of Energenics Systems and a consultant to the group, and Dr. Walter Syniuta, President of Advanced Mechanical Technology of Newton, Massachusetts, one of the group's member companies.

The Energy Conversion Group is a newly formed organization of individuals and companies who believe the United States must make greater investments in technologies which efficiently convert fuel into useful work. We come here to support five sections of the Department of Energy research budget: Energy Conversion and Utilization Technology; Industrial Energy Conservation; Technology and Consumer Products in the Building and Community Systems Program; Coal Utilization, in Fossil Fuels; and Vehicle Propulsion R, D & D in Transportation. Of these five programs only Energy Conversion and Utilization Technology has seen its funding increased, by four million dollars. We believe it should be increased further, by an additional three million dollars. Of the remaining four programs, all have been reduced, two have been reduced drastically and one has been reported to be reduced to zero. We believe strongly that all of these programs should be funded at the level of the 1981 appropriations plus an inflation increase. In short, we see one shining light of hope in the budget. That is the good news. The bad news is that all the rest is like the Pickett Brigade after Pickett's Charge at Gettysburg: decimated. Suddenly a country which is trying to reindustrialize is about to chop support for added efficiency and productivity in industry. A country which burns one-sixth of the world's oil on its

highways has all but abandoned research in advanced automobile engines -- unless this committee reverses the course suggested by the executive branch.

Unless the direction of the budget is reversed, this country will not develop stirring engines with their potential for multifuel capacity and improved efficiency in automobiles and stationary machines. We will fall behind, just when we were beginning to catch up, in cogeneration and other heat recovery technology. We will fail to explore the promising potential for direct conversion of heat to electricity via thermionics. We will not develop improved gas heat pumps, better heat exchange materials, or better lubricants at the pace which is possible. Instead we will find that stirring engines will be coming to us from Sweden and rankine bottoming cycle engines will be built in Japan for import into our country. We stand in danger of losing large portions of the world market for energy efficient industrial and transportation technologies to competitors in Europe and Japan. Equally as serious we will continue to waste energy needlessly here at home.

Mr. Chairman, let us put this question of energy efficiency in perspective. In 1981 Americans will spend over \$400 billion to consume about 82 quads of energy. According to a report of the House Ways and Means Committee an increase of \$5.50 in the price of a barrel of oil results in a two percent increase in inflation, a loss of 400,000 jobs and a lowering of the GNP by 1.4 percent. And it does not matter whether this oil is domestic or foreign, natural or synthetic. As a percentage of total GNP, energy expenditures has more than doubled in seven years, from nine to eighteen percent, and will continue to increase with the fuels of the future, whatever their source.

According to the Georgetown Center for Strategic Studies, out of the 82 quads of energy we will consume this year, the United States will waste 56 percent of that energy. Less than half the BTU value of our fuels will actually heat a home, cook a meal, push a piston, or turn a crankshaft. Of

this wasted energy, about a third, or 15 to 20 quads, is unavoidably lost. The remaining 25 to 30 quads could be saved.

Some of what is wasted can be traced to our 80 million dwellings and 30 billion square feet of commercial space. We know what to do in this sector but difficult institutional, financial, and behavioral barriers stand in the way.

But in the industrial and transportation sectors the obstacles are more likely to be those of technology. We do not have the machines or equipment we need. But we also do not have the integrated research system and we do not have the kind of government-industry planning and cooperation which will quicken the pace of innovation. As we will discuss shortly, this places us at a disadvantage in the world market.

Some will tell you, Mr. Chairman, that higher prices in a free market will cause the proper technologies to emerge. We do not deny that principle but we ask more pertinent questions: At what pace will this technology emerge? Can we afford to wait while the OPEC controlled oil market does its job? And when technologies do emerge, will they emerge from the United States or will they come instead in packing crates from Yokohama, Bremerhaven or Le Havre?

We wish to suggest that this committee look carefully behind the wishful thinking that higher prices alone will do the job. Here are some reasons why we believe you must continue to support industry and transportation-related research on energy efficient products:

First, most United States companies do not have the capital to risk on fundamental research. As an economy we spend a lower percentage of our GNP on fundamental research than do many of our competitors -- and these competitors actually have lower profits than the United States companies.

Second, neither utilities nor industries can afford to place a piece of equipment on line until it is absolutely reliable. Reliability of an energy source or energy converter is more important than its cost. There is no reliability until a new product has been thoroughly tested and operated in an environment comparable to the on-line setting.

Third, utilities are rewarded on the basis of the value of the pipelines, powerplants and facilities they have in use, not on their efficiency. They provide energy, not energy services. It is therefore the slow process of regulation, in 50 states, which frequently must cause necessary changes to be made.

Fourth, anti-trust laws, or fear of those laws, prevents industries from working together to achieve breakthroughs. Breakthroughs are costly and risky and -- particularly for the really big savings -- too hazardous for any one company to undertake.

But surely, some will argue, all of this will change in the new economic environment where more capital and less regulation is to be the order of the day. While agreeing that industry needs more discretionary capital and less regulation, we suggest that more fundamental issues and obstacles are involved here and are worthy of the Committee's attention.

Writing in the September issue of "Atlantic Monthly," James Fallows compared United States companies and their foreign competitors. He looked at the financing of industry in the United States and found it largely controlled by the stock market which responds to yearly profit and loss statements. Japan's industry, by comparison, is financed by long-term debt from national banks. He looked at the incentives to top managers. Because of these influences American managers are rewarded on last year's performance. Japanese managers are rewarded for their performance over a

decade. American business is notoriously short-sighted, he therefore concluded.

Last year's Chairman of the Joint Economic Committee, Senator Lloyd Bentsen, agrees. He told a group of businessmen that American business is out to maximize short-term gains because that is how our reward system works. By comparison, as one aluminum leader pointed out, "The Japanese do everything in the long-run."

So our first point here is that industry will not automatically invest in more research in energy efficiency just because it has more discretionary capital and needs additional incentives and assistance.

Our second point is more precise: our competition will make these investments because in competitor countries government and industry work together. What is more, these countries are now working together on precisely the subjects of this budget: research and development in energy efficiency. That is why they will get into the market first and capture that market, unless the United States accelerates its efforts in these areas. Here is some of the evidence for that statement.

In Japan the research and development subsidy for efficient equipment in industry doubled between 1979 and 1980. France increased its funding for energy efficient research and development five fold in 1980. The French government now spends about \$450 million each year for energy savings technology: about \$300 million for loans, and \$150 million for direct subsidies. This is matched by \$250 million in private funding. Forty-five industrial efficiency demonstration projects were initiated in the last two years.

Germany has been providing research and development grants and subsidies since 1974 in such things as thermal insulation, recovery and use of waste heat, heat pumps and district heating. From 1977 to 1980, Germany spent \$222 million for these activities and in 1978 spent an additional \$56 million for research development and innovation in energy saving technologies.

Sweden gives grants of up to 50 percent for prototypes and demonstration plants in conversion technologies, waste materials, and transportation propulsion systems and grants up to 35 percent for industrial processes including waste heat recovery, conversion to more efficient process equipment, and conversion from oil and natural gas to solid fuels, etc. Sweden is a country of eight million people, four percent the size of the United States and yet by the end of 1979 its government provided \$112.5 million in grants for energy improvements in industrial processes, demonstration plants and industrial and commercial buildings. By 1981 it will have spent an additional 31 million for industrial and related research and development. Great Britain has earmarked one billion dollars for energy conservation in just four years and just recently targeted \$58 million for energy grants and demonstration projects for industry.

To give the Committee a more precise understanding of what the competition is doing, we draw your attention to Japan's program to increase the efficiency of gas turbines by 50 percent in four years. This program aims to a "cascade system" of power plants, a hybrid of gas and steam turbines. Research and development is broken down into the following units: heat resistant metal, heat resistant ceramic materials, turbine blade cooling technology, construction of a prototype 100 megawatt plant which will be "married" to a steam turbine cogeneration system and, finally, the creation of a regional heating and air conditioning system to use waste heat. The cost of this program to the government will be \$70 million.

We have spoken of these developments as if they were only intended to reduce oil use in countries which have few indigenous sources of energy. What we want to stress for the Committee is that each of these countries has built into their planning the aim of taking their technology quickly into the world market. The French are the latest country to vigorously support a new industry to manufacture

energy-saving equipment. To do this they are right now engaging in market studies, setting quality standards, financing preferability studies, providing financial support to companies manufacturing for export, and preparing attractive leasing and credit-for-sale packages for foreign buyers.

We realize, Mr. Chairman, that our competitors are mixed-economies with far more centralized planning than would ever be accepted or appropriate in the United States. We do not propose to imitate "Japan, Inc." But neither do we complain that the Japanese or French are engaged in unsportsmanlike conduct. Energy efficient equipment will be a big business in the 1980's and 1990's and -- as in automobiles and electronics -- our competitors are getting ready for the competition.

Mr. Chairman, we do indeed come here to petition for additional funding but our petition is not just for a change in numbers but a change in philosophy. When it comes to something so critical as energy research, we respectfully suggest that the Congress should help create a comprehensive, coherent, substantial, cooperative program between business and industry to promote research and development for energy conversion and utilization efficiency. A starting point for such a program would be the principle enunciated by the Administration of President Reagan, namely that it is a legitimate function of the government to engage in research which would not otherwise be undertaken by industry but it is not the function of government to commercialize technologies. The program of which we speak is not a program of commercialization. On the other hand we are not speaking of basic research, but instead we are talking conversion technologies and their components in the middle-range -- those which are not proven but which could overcome obstacles and result in substantial savings in roughly the five to fifteen year range. Research and development is the proper role of government, but demonstrating what appear to be

successful technologies is the appropriate role of industry.

To make such a program successful a number of things must happen:

First, the Department of Energy must identify all the pertinent programs, knit them together, and give them four years to work. The Department must end four years of reorganizing, shifting funds and programs, changing leadership and, in general, undercutting the potential with delay and indecision.

Second, the Department must create truly cooperative programs among the inventor community, the national laboratories, the user industries, and the rest of the government and insist that there be cost sharing at all feasible points. The adversarial system so characteristic of government-industry relations must be blunted and the same energy channeled into advancement.

Third, the executive branch must develop a strategy to capture a significant portion of the international market in energy-efficient equipment. This will involve cooperation of several parts of the government, including the Congress. Passage of legislation now before the Congress authorizing the establishment of export trading companies may be of some assistance.

These are, we realize, functions of the executive branch and the executive branch must be willing to adopt such a course. But surely the Congress and this Committee can provide direction and leadership.

This is the real challenge and the exciting future. If we follow this course, we will find that the new frontiers for energy are not just the Overthrust Belt, or the Beaufort Sea, or the Gulf of Campeche but that vast desert of wasted energy where thriving new economic life can be found.

Mr. LOEFFLER. You may proceed as you wish.

HIGHLIGHTS OF STATEMENT

Mr. BRADY. We will just summarize a few highlights of what is important here.

Our group has been formed because we are concerned about the efficiency of the American industrial processes and transportation and the companies that it involves. We are, in fact, a number of technologies in the middle research range. We are not in the immediate application, we are not in the long-term 20-years-of-type research. It is in the middle range where if the right breakthroughs were made we could get on-line in five to fifteen years. These were breakthroughs in Stirling technology, some for homes, some for transportation, some for utilities but all of them in the range which we think is compatible with the philosophy which President Reagan brought to this way of thinking. Find out where the Government can help in the research but don't go into the administration business, and our companies are not in the administration business.

We are interested in five portions of the budget which your staff and this committee has been familiar with. Technology in consumer products which are the gas heaters, water heaters and so on; building community services; coal utilization which you have heard a lot about; vehicle propulsion; and we are particularly interested in Stirling engines. Our feeling is that the figures you put together for 1981 are sufficient to do the job and some reference for inflation. We would be very happy to have you hold at those figures which you have used in the past with some split improvement in energy conservation and technology utilization.

Just going through some things in the statement, on the bottom of page 2 we talk about energy efficiency in a way that maybe it is not often highlighted. The United States will spend about \$400 million to produce 82 quads of energy and of that 82 quads of energy 56 percent of it will be wasted, it will never be used to cook a meal or heat a home or push a piston. The reasons are numerous. One answer is buildings but in the industrial section it is because the technologies do not exist, they have not been invented. It is not like somebody is unwilling to do it.

One of your key questions is why doesn't industry do this already? Our company has looked at this, they are in the business, they would like to do it without government. They do it frequently with cost sharing but the reasons are numerous. We listed some of those reasons beginning at the bottom of page 3.

First of all, most United States companies even with discretionary capital do not spend a sufficient amount of their money on research. In this particular area of research they are able to go up to a certain number of years and a certain viewing down the road but they cannot go beyond a certain horizon and that is where we work. An example of this would be in the advanced automobile technology. Why didn't we get into some of the more efficient automobiles earlier? Why is Japan ahead of us? It is because our company is only looking at a certain range of research and that is across-the-board in a number of different types of technologies.

Secondly, a lot of these pieces of equipment have to be reliable before they can go into an off-the-shelf on to application and so there needs to be absolute reliability and that means the research

has to be good and the development work has to be good before the industry will come in and say, okay, we are willing to jump the gap to see how it will actually work so we come in before that stage.

I am going to skip over some of this.

Our fourth point is that sometimes it takes our Government a lot of time to work together because of either competition or antitrust laws. It takes the Government to help make possible certain types of breakthroughs by serving as a kind of middleman that brings all industry and government together.

Now I guess the main point which we want to make today is to put this all in an international context, international competition. Our companies are trying to sell on the world market and what are they finding? They are finding that they are losing out in competition just the way we have lost out in automobiles. It is quite possible that we could lose out on a whole array of efficiency technologies that are going to be sold on the world market.

On page 5 we draw attention to some recent facts we have been able to get a hold of. In Japan the research and development subsidy for efficient equipment in industry doubled between 1979 and 1980. France increased its funding for energy efficient research and development fivefold in 1980. The French government now spends about \$450 million each year for energy savings technology, about \$300 million for loans and \$150 million for direct subsidies. This is matched by \$250 million in private funding. Forty-five industrial efficiency demonstration projects were initiated in the last two years. Germany has been spending substantial amounts of money.

We refer to Sweden, a country of eight million people. They are spending more than we are in some sections of industry. They have developed a Stirling engine technology far in advance of what we did. Why? They made the investment, they stuck with it, they had a combined government/industry program.

Since our time is running out I want to be sure I bring one thing to your attention. I want to introduce Dr. Syniuta to you who is going to discuss how to win in the world market on some of these technologies.

ASHRAE SHOW

Mr. LOEFFLER. Dr. Syniuta.

Mr. SYNIUTA. Referring to the ASHRAE show in Chicago on heating, air-conditioning and refrigeration at the end of January, we went to see what kinds of heating equipment were coming on the market and there were 22 manufacturers represented. Of the 22, 10 were foreign. Of the 12 domestic manufacturers of boilers, only one manufacturer had a new boiler there. This is the kind of thing that upsets me an awful lot because the new boilers that are coming in from across the seas are really not new, they are 20, 30 years old. The industry in this country is not a General Motors, they are smaller industries and they are not able to do the development work to bring the new efficient boilers on the market.

Another way to emphasize what I think is a very serious problem and emphasize again what I think has happened in the auto industry is going to happen to us in the heating field and the refrigeration field and that is this year we are seeing 10 new manufacturers coming into our market trying to sell to us. They

have a small percentage of the market but in a few years I think the higher percentage will be like we see in the auto industry now.

We are a small company, we have less than 30 people. We are primarily R&D but we have been approached by two foreign companies to do work in areas in which DOE has been funding in the past. On March 1 we will start doing work on bonding die cells for a large Japanese manufacturer. Just two weeks ago I spent three days with a French auto manufacturer talking about ceramic die cells, high temperature combustion work. It is a bit upsetting for a small company such as ours to have to go across the Pacific or the Atlantic to get the funding in order to do the kind of work that we think needs to be done.

EFFICIENCY STANDARDS

Mr. LOEFFLER. I would like to follow up on what you have said.

We know that the governments in West Germany and Japan, for instance, work especially with industry to stimulate them and that is clearly and precisely what you have told us, and the other witnesses during the course of the hearings today have substantiated your statements.

In the United States we have witnessed over the last several decades a government which has caused business to stagnate for various reasons. What is your response to the proposition that we can move ahead with respect to regulatory reform and alleviate some of the impediments that American business have to deal with that Japanese and West German business do not have to deal with? Specifically, what about the efficiency standards that we have with respect to our plants? Is this a help or is this a hindrance to the type of goal where you can have international competition which would be fair for us and for our allies?

Mr. SYNIUTA. Well, I think that to set goals is positive. To set requirements I think is negative. I think whether you set goals or not, the American industry is not going to be able to do the catch-up on the funding that is required and the risks that industry must take in order to meet new energy efficient goals or requirements are just too severe. You cannot invent on schedule, you cannot just plan things and do them by 1985, it is something that you cannot control. I think we need to emphasize our applied research and development.

Mr. LOEFFLER. Your emphasis would be more on research and development rather than regulatory methods that reportedly have been established to conserve?

Mr. SYNIUTA. Yes, sir.

Mr. LOEFFLER. The bottom line has been costly. Can you substantiate that?

Mr. SYNIUTA. I think most definitely it has.

Mr. LOEFFLER. To what extent?

Mr. SYNIUTA. I cannot speak to the exact numbers but I think in the residential boiler business, for example, the kind of approach that has resulted as a result of the regulations is the fact that the American industry has used band-aids in order to catch up in a hurry, such as with stack dampers. I don't look at that as the proper way to go.

Yes, it has had an effect; I think it has improved it definitely.

Mr. LOEFFLER. One more question. Certainly the Japanese and the West Germans must have efficiency standards for their appli-

ances whether it is by regulation or by competition or by technology. Where do they stand in comparison to the United State with regard to the efficiency capabilities of our appliances?

Mr. SYNIUTA. I think in general their efficiencies are higher.

Mr. LOEFFLER. How can that be when in fact they don't have the regulatory departments?

Mr. SYNIUTA. Partially because they are working with smaller units. What is happening to our building industry is that homes are getting tighter, they are less leaky and they are getting smaller and require smaller heating systems and those kinds of systems are available in Japan and West Germany so they are more suited to the things that are happening nowadays in our country. That is part of it.

Mr. LOEFFLER. Do you have anything that you would like to add to the testimony?

Mr. SMITH. The partial answer to the question that you have just raised about the Japanese and the German industries, they have in fact had a long history on research and emphasizing R&D which has probably been stimulated at least in part because they faced much higher oil and gas prices for a much longer period of time than we have but that does not negate the fact that American industries are now in bad shape, and we plan to catch up with them.

Mr. LOEFFLER. Mr. Brady.

Mr. BRADY. Let me try to get the last word on that. I suppose that when we have to step back and look at more than our own business, we realize that business must have more discretionary capital and we therefore must be the best. We are still concerned that the free market really is not free in the sense that our competitors have this joint industry/government cooperation of the type that has been involved in funding proposals before you and if those were simply dropped out we just feel pretty clearly that the Stirling engine work is not going to be done, the advance gas heater work is not going to be done. We would have to, I think, dissent from the view that simply by putting more money into the market kind of advantage that the industry is going to have to do it. We would like to deal with your staff in providing the information and give you the kind of precise information about what is going to happen with particular things with and without this money.

Mr. LOEFFLER. Thank you very, very much.

MEMPHIS GAS

DOE—FOSSIL DEMONSTRATIONS—SYNFUELS

WITNESS

DAVID F. HANSEN, PRESIDENT AND CHIEF EXECUTIVE OFFICER, MEMPHIS LIGHT, GAS & WATER DIVISION

Mr. LOEFFLER. Memphis Gas, Mr. Hansen.

Mr. HANSEN. Thank you, Mr. Congressman.

Mr. LOEFFLER. Without objection, your prepared statement will appear in the record.

[Material follows:]

HOUSE APPROPRIATIONS COMMITTEE
 TESTIMONY TO
 SUBCOMMITTEE ON INTERIOR AND RELATED AGENCIES
 WASHINGTON, D. C. 20515
 FEBRUARY 19, 1981

BY

DAVID F. HANSEN
 PRESIDENT AND CHIEF EXECUTIVE OFFICER
 MEMPHIS LIGHT, GAS AND WATER DIVISION
 220 SOUTH MAIN STREET
 MEMPHIS, TENNESSEE 38103

My name is David F. Hansen, President and Chief Executive Officer of the Memphis Light, Gas and Water Division. It is a pleasure to appear before you today to bring you up-to-date on the progress of the Memphis Industrial Coal Gasification Plant.

Since my last appearance before The House Subcommittee On Interior and Related Agencies on March 19, 1979, the project has had excellent progress. Memphis signed a contract with the Federal Government to proceed to construction on May 21, 1980. The Environmental Impact Statement is complete and without any significant problems. The Environmental Impact Statement should be released within a month and site work can then commence this spring. Memphis is looking forward to fulfilling its contract with the Federal Government, and we sincerely hope the Federal Government will honor its commitments also.

We do have some current difficulty. The Federal Administration is apparently making recommendations on the future conduct of the synfuels development program with little time to carefully evaluate the merits of each project or review the overall position of the program relative to national defense and energy independence. All projects are seemingly viewed as similar in technical and economic risk. The hard work and sizable investments over the past four administrations to nurture synfuels in order to effectively tap our tremendous indigenous coal reserves may be in jeopardy.

As of today, the Memphis project is the premier synfuels development project in the nation. We have a contract. We have a successful environmental review. We are, at last, ready to build. The economics look solid for both the Memphis and the Federal investment. The Memphis contract calls for complete repayment of the Federal investment. Memphis is contributing many times more of its own capital, percentage wise, than is being proposed for any other synfuels project.

Attached to this testimony are two enclosures. The first is a red covered booklet describing the strengths of the Memphis-DOE plant. Basically,

the booklet describes a second generation American technology plant where:

- the plant must be built to fill a technology gap and demonstrate eastern, high sulfur caking coal can be processed. When this is demonstrated, future plants can be built with private capital.
- the plant uses a marketing concept that takes advantage of a dual gaseous delivery system (natural and industrial gas) operated in tandem. This permits high plant load factor and provides 100% reliability back up to the plant through inexpensive storage credits in the natural gas system. This marketing system, even without considering converting a portion of the industrial gas to natural gas equivalent, is projected to fit 79 urban markets with an industrial supply potential of 7 quads. Partial methanization attached to a Memphis type industrial gas plant will broaden the market application even further.
- the plant demonstrates an urban centered synfuels industry where Memphis and the Federal investment serves a dual purpose. The plant will displace foreign oil and provide a clean, competitive fuel and feedstock for urban industry. The basic plant advantage is sizable because industrial gas at 300 Btu's per SCF is only 2/3 as expensive as converting coal to 1000 Btu's per SCF natural gas equivalent. As a tremendous bonus, the plant investment provides a value added manufacturing assist to the urban economy. Cash is retained in the local economy, jobs are created, and the tax base is expanded. In addition, efficient use is made of existing roads, schools, business, labor, essential government services, etc.
- The plant is the fastest critical path to providing continuous oxygen, coal handling, synfuels plant auxiliary services and synfuels product for additional synfuels developmental work. This plant is well ahead of any other project under consideration. Unfortunately, we do not build our pilot plants for sustained operation where supplemental development work can be expeditiously and inexpensively pursued. An operational plant will permit accelerated development of new gasification systems, fuel cells, and feedstock conversion systems to gasoline, jet fuel, and plastics. Even though there is no free lunch, a Memphis operational plant will pay its way on its commercial operations and give R & D a least cost path to pursue further synfuels development.

The second enclosure to this testimony is a financial pro forma on the Memphis plant. This pro forma updates the 1979 Phase I projections that encouraged us to sign the construction contract. A 20% cost increase was

used to update the economic study to February, 1981. This pro forma uses a \$38 per ton coal which is the current TVA cost of low sulfur coal F.O.B., Memphis. Actual cost in 1981 dollars for high sulfur, Kentucky number 9 coal is \$26 - \$28 at mine site so the coal expense is very conservative. The pro forma assumes 10% escalation of coal and industrial gas pricing per year and all other costs advancing at 8% annual escalation through construction and start up. At the request of DOE, the analysis includes a 25% contingency factor for total construction costs.

Even with high estimated coal costs, a 25% contingency on total costs and various load factor performance assumptions, the plant is a solid financial winner. The basic financial risk is the potential of prolonged start up difficulty because of the new technology. A capital carrying cost of 10% a year for a \$700 million plant is a cost Memphis cannot afford and, therefore, cannot be financed in the private sector. Even though pilot plant performance was excellent, and Memphis has chosen the simplest, lowest pressure, lowest temperature, and most forgiving fluidized bed technology, the private financial markets will not risk any new technology of this cost magnitude. Memphis has to pledge the entire earning power of its natural gas business in order to raise its share of the plant cost.

A second financial projection is presented in enclosure two that views the Federal investment from both a cash flow and ROI basis. This pro forma was completed to address the budget deficit concerns of the Federal Treasury. The first page of the pro forma entitled "Payback To The United States Treasury", calculated that a Federal investment of \$697 million in dollars escalated through the construction and testing phase of the project will return a cash flow in tax receipts from Memphis and the Federal investment of over \$490 million during the same period. In other words, the Federal Treasury will see a maximum \$200 million cash flow outlay by 1986. At that point, plant operation will commence to repay the total Federal investment, as well as, providing tax income receipts associated with a producing industrial enterprise. The overall return on investment to the Treasury from construction through payback is 10.3%. There is no other synfuels project under consideration that provides this cash flow and investment return to the Federal Government.

Thank you for your past support and encouragement. We have a top quality synfuels project that will help solve our national energy concerns. It will be a good investment for both the United States Treasury and Memphis. It is a solid project, both technically and financially. We look forward to honoring our contractual obligations to build a successful plant. We respectfully request your support in encouraging the Federal Government to honor its contract commitments also.

DAVID F. HANSEN
 PRESIDENT AND CHIEF EXECUTIVE OFFICER
 MEMPHIS LIGHT, GAS AND WATER DIVISION
 220 SOUTH MAIN STREET
 MEMPHIS, TENNESSEE 38103

Mr. Hansen serves as President and Chief Executive Officer of the Memphis Light, Gas and Water Division, as well as, a member of the Board of Commissioners. In this capacity, he reports to the Mayor and Council of the City of Memphis.

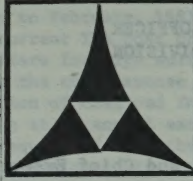
Mr. Hansen was born in Ada, Minnesota in January, 1928.

He graduated from the University of Minnesota in 1951, with a Bachelor of Science Degree in Mechanical Engineering.

Before joining the staff at the Memphis Light, Gas and Water Division in October, 1979, he was employed with the Minnesota Gas Company from 1954-1972, with a final position as Vice President of Marketing. He was President and Chief Executive Officer of Pennsylvania Gas and Water Company from 1972-1978.

Mr. Hansen is an active member in:

American Gas Association
 American National Standards Institute
 American Management Association
 American Public Power Association
 Tennessee Valley Public Power Association



MEMPHIS - DOE INDUSTRIAL SYNFUEL PLANT

2/3/81

IMPORTANT BACKGROUND INFORMATION

ON THE

INDUSTRIAL SYNFUELS PLANT

1. THE PLANT USES AMERICAN TECHNOLOGY.
2. THE PROJECT STARTED DURING THE FORD ADMINISTRATION.
3. MEMPHIS HAS AGREED BY CONTRACT TO PAY BACK THE FEDERAL GOVERNMENT.
4. MEMPHIS HAS PLEDGED ASSETS AND EARNING POWER OF ITS ENTIRE NATURAL GAS SYSTEM. THIS SYSTEM HAS \$151 MILLION NET ASSETS AT ORIGINAL COST AND ONLY \$8 MILLION DEBT. THIS FINANCIAL STRENGTH IS UNIQUE IN INDUSTRY. MEMPHIS CANNOT RAISE ADDITIONAL CAPITAL FOR THE PLANT. THE CAPITAL MARKET WILL NOT RESPOND TO PLANT REVENUE BONDS FOR THIS TECHNOLOGY AT PRESENT.
5. MEMPHIS HAS AGREED TO REIMBURSE THE GOVERNMENT ON AN ACCELERATED BASIS FOR THE FULL VALUE OF PHASE II OVERRUNS.
6. THE MEMPHIS CONTRACT IS THE ONLY SYNFUELS PROJECT THAT HAS THEIR MAJOR SUBCONTRACTOR ON AN AWARD FEE BASIS.
7. THE MEMPHIS PLANT HAS APPLIED FOR ENVIRONMENTAL PERMITS AND HAS NOT REQUIRED EXEMPTIONS.
8. THE MEMPHIS PLANT IS THE ONLY SYNFUELS PROJECT READY TO START PHASE II (CONSTRUCTION) IN APRIL, 1981.
9. THE MEMPHIS PROJECT IS EXTRAORDINARY- THE FEDERAL GOVERNMENT HAS A CONTRACTUAL OBLIGATION WITH MEMPHIS. MEMPHIS HAS A \$100 MILLION INVESTMENT OF WHICH A PORTION HAS ALREADY BEEN CONTRIBUTED AND EXPENDED.
10. THE MEMPHIS PROJECT WILL PROVIDE BASE LINE ENVIRONMENTAL AND SAFETY DATA FOR FUTURE SYNFUELS PROJECTS.
11. MEMPHIS TYPE PLANTS WILL OFFER AN ALTERNATIVE TO INDUSTRIAL OIL CONSUMPTION AND WILL HELP STABILIZE ENERGY COSTS.
12. THE MEMPHIS PLANT IS A SENSIBLE FIRST STEP TO ENABLE AN ORDERLY DEVELOPMENT OF A SYNFUELS INDUSTRY.
13. MEMPHIS TYPE PLANTS CAN PLAY A KEY ROLE IN DISPLACING LIQUID FUELS THAT ARE NEEDED FOR TRANSPORTATION AND MILITARY DEFENSE PURPOSES.
14. THE MEMPHIS PLANT IS A SOUND BUSINESS INVESTMENT FROM BOTH MEMPHIS AND THE FEDERAL GOVERNMENT POINT OF VIEW.
15. THE MEDIUM BTU GAS FROM THE MEMPHIS PLANT WITH SOME MINOR ADDITIONAL PROCESS STEPS CAN MAKE CHEMICAL FEEDSTOCKS AND GASOLINE.
16. A PORTION OF THE MEDIUM BTU GAS WILL BE METHANATED TO PIPELINE QUALITY GAS.

PLANT STATISTICSDAILY INPUT

- COAL (KENTUCKY #9 HIGH SULFUR CAKING @ 11,700 BTU/TON) 3158 TON/DAY
- ELECTRIC 42.2 MW
- TOTAL BTU INPUT (COAL PLUS ELECTRICITY) 74 BILLION/DAY
- WATER 2.5 MILLION GAL/DAY

DAILY OUTPUT

- INDUSTRIAL FUEL GAS AND/OR PETROCHEMICAL FEEDSTOCK (300 BTU/SCF) 154 MMSCFD
- SYNTHETIC PIPELINE GAS (965 BTU/SCF NATURAL GAS EQUIVALENT) 4.3 MMSCFD
- TOTAL BTU OUTPUT 50 BILLION BTU/DAY
- SULFUR (ASPHALTIC CONCRETE AND FERTILIZER) 100 TONS/DAY
- ASH AGGLOMERATES (STERILE LIGHT WEIGHT CONSTRUCTION MATERIAL) 425 TONS/DAY
- CO₂ (TERTIARY OIL FIELD PRODUCTION) 3360 TONS/DAY
- ARGON (INDUSTRIAL GAS) 70 TONS/DAY
- LIQUID N₂ (INDUSTRIAL GAS) 6065 TONS/DAY

PLANT EFFICIENCY

COAL PLUS ELECTRICITY/INDUSTRIAL GAS 69.3%

THE MEMPHIS - DOE COAL GASIFICATION PLANT

PHASE I 1976 - 1980*

\$ 11.7 MILLION

- PILOT PLANT OPERATION - FLUIDIZED BED GASIFIER
- PRELIMINARY DESIGN
- ECONOMIC PRO-FORMA
- ENVIRONMENTAL IMPACT STATEMENT

PHASE II 1981 - 1984** ESTIMATE

\$ 344 MILLION

- CONSTRUCTION DESIGN
- PLANT CONSTRUCTION

PHASE III 1984 - 1986 (20 MONTHS)** ESTIMATE

\$ 72 MILLION

- PLANT START-UP AND SHAKE DOWN

TOTAL

\$427.7 MILLION

THE TOTAL COST FOR PHASES II & III IS PROJECTED TO BE \$830 MILLION,

WHICH INCLUDES ESCALATION, CONTINGENCIES AND GOVERNMENT SUPPORT COSTS.

* ACTUAL COST

** OCTOBER 1979 DOLLARS PER CONTRACT

CONTRACT PROVISIONS AND PRODUCT COSTS

MEMPHIS INVESTMENT

- PLANT \$ 100 MILLION
- INDUSTRIAL GAS PIPELINES
DUAL FUEL BURNER SYSTEMS AND
LIQUIFIED NATURAL GAS OR
UNDERGROUND NATURAL GAS STORAGE \$ 35-50 MILLION

FEDERAL INVESTMENT

- PLANT \$ 730 MILLION

REPAYMENT OF FEDERAL INVESTMENT

- 27 YEARS

PRODUCT COST - 1981

- INCLUDING DEBT SERVICE, 20 YEAR DEPRECIATION SCHEDULE,
COAL AT \$ 38 TON 1981 \$7,75 MILLION BTU

COMPARATIVE DATA

- COST #2 FUEL OIL MEMPHIS 1981 \$7.24 MILLION BTU
- COST #6 FUEL OIL MEMPHIS 1981 \$4.93 MILLION BTU
- PLANT CAPACITY IN EQUIVALENT GALS. #2 OIL 362,082 GAL. #2 OIL/DAY
- PLANT CAPACITY IN EQUIVALENT BBLs OIL
TO PRODUCE 362,082 GALS. #2 OIL/DAY 26,941 BBLs OIL/DAY
- ENERGY OUTPUT EQUIVALENCY TO AN ELECTRICAL
GENERATING PLANT 610 MW

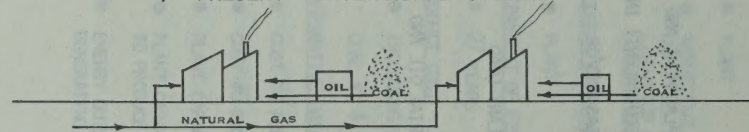
THE MEMPHIS INNOVATIVE MARKETING SYSTEM

- SUPPLY MULTI PLANT ENERGY AND CHEMICAL FEEDSTOCK REQUIREMENTS USING BOTH INDUSTRIAL GAS AND NATURAL GAS.
- STORE RESERVE CREDITS (THRU NATURAL GAS CONSUMPTION DISPLACEMENT AND 10% TO 30% OF COAL GAS PLANT PRODUCTION TO NATURAL GAS EQUIVALENT) IN THE MEMPHIS NATURAL GAS SYSTEM. USE LIQUIFIED NATURAL GAS AND/OR UNDERGROUND STORAGE FOR RESERVE CREDITS.
- USE STORAGE CREDITS IN NATURAL GAS SYSTEM TO EVEN OUT PLANT LOAD FACTOR AND PROVIDE 100% BACK-UP FOR THE COAL GAS PLANT.
- THE MEMPHIS DUAL GASEOUS SUPPLY SYSTEM WILL MAKE INDUSTRIAL OIL AND COAL STANDBY FUEL UNNECESSARY.

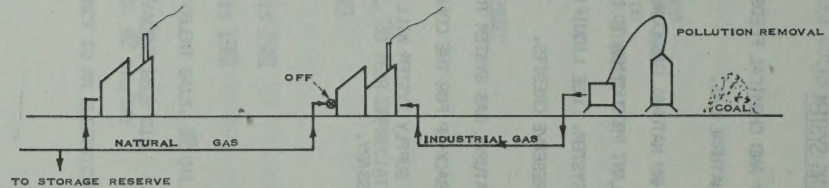
CLEVELAND, OH
 NEWARK, NJ
 BALTIMORE, MD
 YORKTOWN-HAMPSHIRE, OH
 DALLAS-FORT WORTH, TX
 BUFFALO, NY
 NEW YORK, NY
 MINNEAPOLIS-ST. PAUL, MN
 CINCINNATI, OH
 BIRMINGHAM, AL
 DALLAS, TX
 HUNTINGTON-ASHLAND, WV
 MILWAUKEE, WI
 RIVERSIDE-SAN BERNARDINO-CALIFORNIA, CA
 STEUBENVILLE-WEAVER, OH
 TOLEDO, OH
 PORTLAND, OR
 MEMPHIS, TN
 WILMINGTON, DE
 ALBANY-BETHLEHEM-EASTON, PA
 PENSACOLA, FL
 LITTLE ROCK-NORTH LITTLE ROCK, AR
 JACKSONVILLE, FL
 CANTON, OH
 NEW BRUNSWICK-PERTH AMBOY-SAYREVILLE, NJ
 CINCINNATI, OH
 HAMILTON-MIDDLETON, OH
 MOBILE, AL
 BOSTON, MA
 CHATTANOOGA, TN
 DENVER-DALLAS, CO
 PETERSBURG-COLONIAL HEIGHTS-HOPKINS, VA

HOW THE ENERGY SYSTEM WORKS

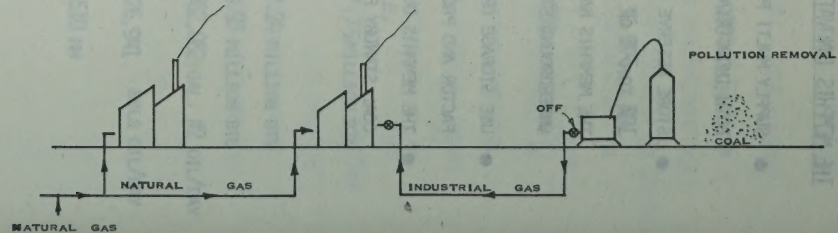
1) PRESENT CONVENTIONAL SYSTEM



2) THE MEMPHIS SYSTEM--INDUSTRIAL GAS PLANT ON



3) THE MEMPHIS SYSTEM--INDUSTRIAL GAS PLANT OFF



THE MEMPHIS PLANT AND MARKETING SYSTEM HAS BROAD NATIONAL APPLICATION

SRI INTERNATIONAL PROJECTS¹

- 7 QUAD POTENTIAL BY YEAR 2000
- A MEMPHIS TYPE SYSTEM IS CURRENTLY SUITABLE TO THE FOLLOWING URBAN AREAS:

1. HOUSTON, TX
2. BEAUMONT-PORT ARTHUR-ORANGE, TX
3. BATON ROUGE, LA
4. CHICAGO, IL
5. GARY-HAMMOND-EAST CHICAGO, IN
6. PHILADELPHIA, PA
7. GALVESTON-TEXAS CITY, TX
8. PITTSBURG, PA
9. DETROIT, MI
10. LAKE CHARLES, LA
11. LOS ANGELES-LONG BEACH, CA
12. SAN FRANCISCO-OAKLAND, CA
13. NEW ORLEANS, LA
14. CORPUS CHRISTI, TX
15. ST. LOUIS, MO-IL
16. CLEVELAND, OH
17. NEWARK, NJ
18. BALTIMORE, MD
19. YOUNGSTOWN-WARREN, OH
20. DALLAS-FORT WORTH, TX
21. BUFFALO, NY
22. NEW YORK, NY-NJ
23. MINNEAPOLIS-ST. PAUL, MN-WI
24. TULSA, OK
25. BIRMINGHAM, AL
26. KANSAS, MO-KS
27. HUNTINGTON-ASHLAND, WV-KY-OH
28. MILWAUKEE, WI
29. RIVERSIDE-SAN BERNARDINO-ONTARIO, CA
30. STEUBENVILLE-WEIRTON, OH-WV
31. TOLEDO, OH-MI
32. PORTLAND, OR-WA
33. MEMPHIS, TN-AR-MS
34. WILMINGTON, DE-NJ-MD
35. ALLENTOWN-BETHLEHEM-EASTON, PA
36. PENSACOLA, FL
37. LITTLE ROCK-NORTH LITTLE ROCK, AR
38. JACKSONVILLE, FL
39. CANTON, OH
40. NEW BRUNSWICK-PERTH AMBOY-SAYREVILLE, NJ
41. CINCINNATI, OH-KY-IN
42. HAMILTON-MIDDLETOWN, OH
43. MOBILE, AL
44. BOSTON, MA
45. CHATTANOOGA, TN-GA
46. DENVER-Boulder, CO
47. PETERSBURG-COLONIAL HEIGHTS-HOPEWELL, VA

48. ODESSA, TX
49. SALT LAKE CITY-OGDEN, UT
50. MONROE, LA
51. AUGUSTA, GA-SC
52. COLUMBUS, OH
53. SHREVEPORT, LA
54. ALBANY-SCHENECTADY-TROY, NY
55. SAN JOSE, CA
56. LOUISVILLE, KY-IN
57. SEATTLE-EVERETT, WA
58. ATLANTA, GA
59. GREENVILLE-SPARTANBURG, SC
60. WILMINGTON, WV
61. CHARLESTON, WV
62. CHARLESTON, SC
63. WICHITA, KS
64. SYRACUSE, NY
65. TAMPA, ST. PETERSBURG, FL
66. DAYTON, OH
67. INDIANAPOLIS, IN
68. APPLETON-OSHKOSH, WI
69. KALAMAZOO, PORTAGE, MI
70. ANAHEIM-SANTA ANA-GARDEN GROVE, CA
71. NASHVILLE-DAVIDSON, TN
72. JERSEY CITY, NJ
73. FLORENCE, AL
74. ROCHESTER, NY
75. RICHMOND, VA
76. LORAIN-ELYRIA, OH
77. STOCKTON, CA
78. LIMA, OH
79. SAN ANTONIO, TX

1 - INDUSTRIAL MARKET POTENTIAL FOR INTERMEDIATE - BTU GAS FROM COAL IN
THE UNITED STATES SRI INTERNATIONAL - SEPT., 1979.

ADVANTAGE OF MEMPHIS URBAN PLANT OVER MINE-MOUTH PLANT PRODUCING 1000 BTUSCF NATURAL GAS EQUIVALENT.

- 2/3 THE COST PER MILLION BTU
- PLANT CAN BE SITED IN EXISTING INDUSTRIAL AREA
- ROADS, HOUSING, UTILITIES, SCHOOLS, GOVERNMENT SERVICES, BUSINESS SUPPORT AND SKILLED LABOR ALREADY IN PLACE.
- PLANT INVESTMENT AND OPERATION PROVIDES A DOUBLE BENEFIT
 1. DEVELOPES A SECURE SOURCE OF HIGH ENVIRONMENTAL QUALITY FUEL AND FEEDSTOCK
 2. HAS A MAJOR IMPACT ON IMPROVING THE URBAN ECONOMY

5 - THE ECONOMY OF THE MEMPHIS INDUSTRIAL FUEL GAS DEMONSTRATION PLANT. BUREAU OF BUSINESS AND ECONOMIC RESEARCH, MEMPHIS STATE UNIVERSITY - JANUARY 1, 1980

ECONOMIC BENEFIT TO THE MEMPHIS URBAN ECONOMY²PHASE II - CONSTRUCTION (42 MONTHS)

- \$151 MILLION IN LOCAL BUSINESS VOLUME
- AVERAGE EMPLOYMENT - 2486 JOBS

PHASE III - TEST (20 MONTHS)

- \$33.6 MILLION IN LOCAL BUSINESS VOLUME
- AVERAGE EMPLOYMENT - 1886 JOBS

OPERATION - (20 YEARS)

- \$2.2 BILLION IN LOCAL BUSINESS VOLUME
- CREATION OF 9641 JOBS

IN LIEU OF TAX CONTRIBUTION TO LOCAL GOVERNMENT

- EQUIVALENT TO 45.5% OF PRESENT MEMPHIS RESIDENTIAL TAX BASE

2 - THE ECONOMY OF THE MEMPHIS INDUSTRIAL FUEL GAS DEMONSTRATION PLANT. BUREAU OF BUSINESS AND ECONOMIC RESEARCH, MEMPHIS STATE UNIVERSITY - JANUARY 1, 1980

ADDITIONAL BENEFITS FROM THE MEMPHIS COAL GAS PLANT

THE U-GAS FLUIDIZED BED GASIFIER

- WILL PROVE AN ESSENTIAL SYNFUELS TECHNOLOGY THAT CAN OPERATE WITH EASTERN HIGH SULPHUR CAKING COAL.
- WILL IMPROVE CONVERSION EFFICIENCY FROM PRESENT PROVEN TECHNOLOGY NOW SUITABLE ONLY TO NON-CAKING COAL FROM 55% TO 70%.
- THE U-GAS PROCESS IS LOWER TEMPERATURE, LOWER PRESSURE AND MORE FORGIVING TO OPERATING CONDITION CHANGES THAN PRESENT TEXACO, SLAGGING LURGI OR KOPPERS - TOTZEK SYSTEMS. THE RESULT IS LOWER RISK TO ACHIEVE SUCCESSFUL PERFORMANCE.

FINANCING SYNFUEL PLANTS

- REVENUE BONDS CANNOT BE SOLD TO FINANCE A NEW TECHNOLOGY PLANT.
- MEMPHIS HAS PLEDGED ITS ENTIRE NATURAL GAS SYSTEM TO RAISE ITS SHARE OF PLANT INVESTMENT.
(NET PLANT AT ORIGINAL COST \$131 MILLION - \$8 MILLION DEBT).
- ONLY SUCCESSFUL OPERATION OF THE MEMPHIS PLANT WILL ENABLE FINANCING FUTURE SUCH PLANTS THROUGH PRIVATE CAPITAL MARKETS.

THE VALUE OF AN OPERATIONAL MEMPHIS PLANT

- MEMPHIS IS THE ONLY SYNFUELS PLANT READY FOR CONSTRUCTION. IT IS TWO TO FIVE YEARS AHEAD OF ANY OTHER PLANT FOR CONTINUOUS OPERATION POTENTIAL.
- MEMPHIS HAS AGREED TO DEDICATE $1/3$ OF PLANT OUTPUT FOR CONVERSION TO LIQUID FUELS. THE U.S. LIQUID FUELS SUPPLY CONTINUES TO BE TENUOUS BOTH THE SHORT AND LONG-TERM. AN OPERATIONAL MEMPHIS PLANT WILL PERMIT DEVELOPMENT WORK ON COAL TO GAS TO LIQUID FUELS (METHANOL, GASOLINE AND JET FUEL) IN PARALLEL WITH THE DIRECT COAL TO LIQUID FUEL PROJECTS.
- AN OPERATIONAL MEMPHIS PLANT CAN PERMIT MORE RAPID DEVELOPMENT OF OTHER GASIFIER SYSTEMS BY PROVIDING CONTINUOUS COAL HANDLING, OXYGEN PRODUCTION AND AUXILIARY SUPPORT SERVICES.
- AN OPERATIONAL MEMPHIS PLANT CAN ACCELERATE TESTING OF DIFFERENT COALS AND BIOMASS PRODUCTS IN GASIFIERS.
- AN OPERATIONAL MEMPHIS PLANT CAN ENHANCE FUEL CELL DEVELOPMENT AND TESTING WORK.

2 - The Economy of the Memphis Industrial Fuel Gas Demonstration Plant. Bureau of Business and Economic Research, Memphis State University - January 1, 1980

SYNFUELS AND NUCLEAR DEVELOPMENT

WHILE DEVELOPMENT OF BOTH ENERGY SYSTEMS IS CRITICAL TO FUTURE ENERGY SECURITY -

- THE MEMPHIS SYNFUELS PLANT PRODUCES 3 TIMES THE ENERGY PER CAPITAL DOLLAR INVESTMENT AS A CONVENTIONAL BURNER REACTOR NUCLEAR PLANT.
- SUCCESSFUL OPERATION OF THE MEMPHIS PLANT WILL ENABLE RAPID CONSTRUCTION OF ADDITIONAL PLANTS. THE TIME TO CONSTRUCT SUCH PLANTS IS ONE HALF THE TIME TO BUILD A NUCLEAR PLANT.
- THE ABILITY TO STORE ENERGY IN THE NATURAL GAS SYSTEM AT LOW COST MAKES THE DUAL SYNFUEL - NATURAL GAS ENERGY DELIVERY SYSTEM EXCEPTIONALLY EFFICIENT. NUCLEAR-ELECTRIC ENERGY SYSTEMS DO NOT HAVE THIS FLEXIBILITY.

FINANCIAL ANALYSIS

MEMPHIS PROJECT

February 1981

DOE Contribution		
1979 Dollars		\$395.1MM
DOE Contribution		
Escalated Dollars		\$697MM
Payment Back to US Treasury		
	1979	Escalated
	<u>Dollars</u>	<u>Dollars</u>
Phase II	224.9MM	396.7
Phase III	53.4MM	94.2
Direct Payback	293.8	518.3
Commercial (Post Demo)		
Operation 27 yrs		
a) Pers. Income Taxes	523.6MM	\$2,988
b) Indirect Income Taxes	240.6MM	5,444.6
c) Materials/Goods Taxes	<u>67.1MM</u>	<u>327.1</u>
	\$1,403.4MM	\$9,813.9MM
Annual ROI	3.8%	10.3%

CUMULATIVE CASHFLOW TO MEMPHIS

(\$000,000)

	90% SF	80% SF
Base Case (Gas Cost \$8.00)	802	565
Build Up of Service Factor	714	512
Escalated	15,556	13,372

MINIMUM GAS PRICE

	90% SF	80% SF
Gov't. Repaid according to Contract	6.81	7.27
Memphis CF Used to Reduce Gas Lost	6.17	6.55

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DATE: 81-0441 TIME: 13:56:20.21 PROG: PRPV

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1

MLGW-DOE 1981 \$6.17 CONSTANT, S.F., 90%

1981/02/13

	INVEST.	GOVERN.	CUM.	MEMPHIS	CUMUL.	ESCROW	CUMUL.	INT.ESC.	INT.DEBT	DIFF.	CUM.	ESCROW +
1	82.000-	82.000	82.000			17.000	17.000	2.550	1.445	1.105	1.105	18.105
2	109.000-	109.000	191.000			21.800	38.800	5.966	3.298	2.668	3.793	42.593
3	220.000-	220.000	411.000			44.000	82.800	12.989	7.038	5.951	9.744	92.544
4	150.000-	150.000	561.000			17.200	100.000	16.462	8.500	7.962	17.705	117.705
5	81.000-		561.000	81.000	81.000		100.000	5.506	8.500	2.994	14.711	33.711
6	80.000-	60.108	621.107	19.892	100.892		100.000	2.073	8.500	6.427-	8.284	7.391
7	75.000-	75.000	696.107		100.892		100.000	1.109	8.500	7.391-	.892	

	CASHFLOW	DEBT	NET	GOVT.	CUMUL.	MEMPHIS	CUMUL.
8	27.021	10.567	16.454	16.454	16.454		
9	27.021	10.567	16.454	16.454	32.909		
10	27.021	10.567	16.454	16.454	49.363		
11	27.021	10.567	16.454	16.454	65.818		
12	27.021	10.567	16.454	16.454	82.272		
13	27.021	10.567	16.454	16.454	98.726		
14	27.021	10.567	16.454	16.454	115.181		
15	27.021	10.567	16.454	16.454	131.635		
16	27.021	10.567	16.454	16.454	148.090		
17	27.021	10.567	16.454	16.454	164.544		
18	27.021	10.567	16.454	16.454	180.998		
19	27.021	10.567	16.454	16.454	197.453		
20	27.021	10.567	16.454	16.454	213.907		
21	27.021	10.567	16.454	16.454	230.362		
22	27.021	10.567	16.454	16.454	246.816		
23	27.021	10.567	16.454	16.454	263.270		
24	27.021	10.567	16.454	16.454	279.725		
25	27.021	10.567	16.454	16.454	296.179		
26	27.021	10.567	16.454	16.454	312.634		
27	27.021	10.567	16.454	16.454	329.088		
28	27.021		27.021	27.021	356.109		
29	27.021		27.021	27.021	383.131		
30	27.021		27.021	27.021	410.152		
31	27.021		27.021	27.021	437.174		
32	27.021		27.021	27.021	464.195		
33	27.021		27.021	27.021	491.217		
34	27.021		27.021	25.872	517.089	1.149	1.149

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7
1

MLGW-DOE 1981 \$6.81 CONSTANT, S.F., 90%

1981/02/13

	INVESTH. GOVERNH.	CUM.	MEMPHIS	CUMUL.	ESCROW CUMUL.	INT.ESC.	INT.DEBT	DIFF.	CUM.	ESCROW +
1	82,000-	82,000			17,000	2,550	1,445	1,105	1,105	10,105
2	109,000-	109,000			21,800	38,800	5,986	3,298	2,568	3,793
3	220,000-	220,000			44,000	82,800	12,989	7,038	5,951	9,744
4	150,000-	150,000			17,200	100,000	16,462	8,500	7,962	17,705
5	81,000-	561,000	81,000	81,000	100,000	5,506	8,500	2,994-	14,711	33,711
6	80,000-	60,108	19,892	100,892	100,000	2,073	8,500	6,427-	6,284	7,391
7	75,000-	75,000		100,892	100,000	1,109	8,500	7,391-	.892	

	CASHFLOW	DEBT	NET	GOVT.	CUMUL.	MEMPHIS	CUMUL.
8	37,411	10,567	26,844	17,448	17,448	9,395	9,395
9	37,411	10,567	26,844	17,448	34,897	9,395	18,791
10	37,411	10,567	26,844	17,448	52,345	9,395	28,186
11	37,411	10,567	26,844	17,448	69,794	9,395	37,581
12	37,411	10,567	26,844	17,448	87,242	9,395	46,976
13	37,411	10,567	26,844	17,448	104,690	9,395	56,372
14	37,411	10,567	26,844	17,448	122,139	9,395	65,767
15	37,411	10,567	26,844	17,448	139,587	9,395	75,162
16	37,411	10,567	26,844	17,448	157,036	9,395	84,558
17	37,411	10,567	26,844	17,448	174,484	9,395	93,953
18	37,411	10,567	26,844	17,448	191,932	9,395	103,348
19	37,411	10,567	26,844	17,448	209,381	9,395	112,744
20	37,411	10,567	26,844	17,448	226,829	9,395	122,139
21	37,411	10,567	26,844	17,448	244,278	9,395	131,534
22	37,411	10,567	26,844	17,448	261,726	9,395	140,929
23	37,411	10,567	26,844	17,448	279,174	9,395	150,325
24	37,411	10,567	26,844	17,448	296,623	9,395	159,720
25	37,411	10,567	26,844	17,448	314,071	9,395	169,115
26	37,411	10,567	26,844	17,448	331,520	9,395	178,511
27	37,411	10,567	26,844	17,448	348,968	9,395	187,906
28	37,411		37,411	24,317	373,285	13,094	201,000
29	37,411		37,411	24,317	397,602	13,094	214,093
30	37,411		37,411	24,317	421,919	13,094	227,187
31	37,411		37,411	24,317	446,236	13,094	240,281
32	37,411		37,411	24,317	470,553	13,094	253,375
33	37,411		37,411	24,317	494,870	13,094	266,469
34	37,411		37,411	22,652	517,522	14,759	281,228

307

DATE: 81-0441 TIME: 11:37:50.2: CPU TIME: 0000.7 SEC
READY

..MLOW-DOE 1981 \$6.55 CONSTANT, S.F., 60%

1981/02/13

	INVESTM.	GOVERNMENT	CUM.	MEMPHIS	CUMUL.	ESCRGW	CUMUL.	INT.ESC.	INT.DEBT	DIFF.	CUM.	ESCRGW +
1	82.000-	82.000	82.000			17.000	17.000	2.550	1.445	1.105	1.105	18.105
2	109.000-	109.000	191.000			21.800	38.800	5.986	3.298	2.688	3.793	42.593
3	220.000-	220.000	411.000			44.000	82.800	12.989	7.058	5.951	9.744	92.544
4	150.000-	150.000	561.000			17.200	100.000	16.462	8.500	7.962	17.705	117.705
5	81.000-		561.000	81.000	81.000		100.000	5.506	3.500	2.994-	14.711	33.711
6	80.000-	60.108	621.107	19.892	100.892		100.000	2.073	8.500	6.427-	8.284	7.391
7	75.000-	75.000	696.107		100.892		100.000	1.109	8.500	7.391-	.892	

	CASHFLOW	DEBT	NET	GOVT.	CUMUL.	MEMPHIS	CUMUL.
8	27.003	10.567	16.436	16.436	16.436		
9	27.003	10.567	16.436	16.436	32.872		
10	27.003	10.567	16.436	16.436	49.308		
11	27.003	10.567	16.436	16.436	65.744		
12	27.003	10.567	16.436	16.436	82.180		
13	27.003	10.567	16.436	16.436	98.616		
14	27.003	10.567	16.436	16.436	115.052		
15	27.003	10.567	16.436	16.436	131.488		
16	27.003	10.567	16.436	16.436	147.924		
17	27.003	10.567	16.436	16.436	164.360		
18	27.003	10.567	16.436	16.436	180.796		
19	27.003	10.567	16.436	16.436	197.232		
20	27.003	10.567	16.436	16.436	213.668		
21	27.003	10.567	16.436	16.436	230.104		
22	27.003	10.567	16.436	16.436	246.540		
23	27.003	10.567	16.436	16.436	262.976		
24	27.003	10.567	16.436	16.436	279.412		
25	27.003	10.567	16.436	16.436	295.848		
26	27.003	10.567	16.436	16.436	312.284		
27	27.003	10.567	16.436	16.436	328.720		
28	27.003		27.003	27.003	355.723		
29	27.003		27.003	27.003	382.726		
30	27.003		27.003	27.003	409.729		
31	27.003		27.003	27.003	436.732		
32	27.003		27.003	27.003	463.735		
33	27.003		27.003	27.003	490.739		
34	27.003		27.003	26.100	516.839	.903	.903

VIBASIC PRPVS 1
 DATE: 81-044: TIME: 12133144.81 PROG: PRPVS
 FILE : 1=REQ. 2=ESC.
 ?
 1

MLGW-DOE 1981 \$7.27 CONSTANT, S.F., 60%

1981/02/13

	INVESTM.	GOVERN.	CUM.	MEMPHIS	CUMUL.	ESCROW	CUMUL.	INT.ESC.	INT.DEBT	DIFF.	CUM.	ESCROW +
1	82.000-	82.000	82.000			17.000	17.000	2.550	1.445	1.105	1.105	18.105
2	109.000-	109.000	191.000			21.800	38.800	5.986	3.298	2.688	3.793	42.593
3	220.000-	220.000	411.000			44.000	82.800	12.989	7.038	5.951	9.744	92.544
4	150.000-	150.000	561.000			17.200	100.000	16.462	8.500	7.962	17.705	117.705
5	81.000-		561.000	81.000	81.000		100.000	5.506	8.500	2.994-	14.711	33.711
6	80.000-	60.108	621.107	19.892	100.892		100.000	2.073	8.500	6.427-	8.284	7.391
7	75.000-	75.000	696.107		100.892		100.000	1.109	8.500	7.391-	.892	

	CASHFLOW	DEBT	NET	GOVT.	CUMUL.	MEMPHIS	CUMUL.
8	37.392	10.567	26.825	17.436	17.436	9.389	9.389
9	37.392	10.567	26.825	17.436	34.873	9.389	18.778
10	37.392	10.567	26.825	17.436	52.309	9.389	28.167
11	37.392	10.567	26.825	17.436	69.746	9.389	37.555
12	37.392	10.567	26.825	17.436	87.182	9.389	46.944
13	37.392	10.567	26.825	17.436	104.619	9.389	56.333
14	37.392	10.567	26.825	17.436	122.055	9.389	65.722
15	37.392	10.567	26.825	17.436	139.492	9.389	75.111
16	37.392	10.567	26.825	17.436	156.928	9.389	84.500
17	37.392	10.567	26.825	17.436	174.364	9.389	93.889
18	37.392	10.567	26.825	17.436	191.801	9.389	103.277
19	37.392	10.567	26.825	17.436	209.237	9.389	112.666
20	37.392	10.567	26.825	17.436	226.674	9.389	122.055
21	37.392	10.567	26.825	17.436	244.110	9.389	131.444
22	37.392	10.567	26.825	17.436	261.547	9.389	140.833
23	37.392	10.567	26.825	17.436	278.983	9.389	150.222
24	37.392	10.567	26.825	17.436	296.420	9.389	159.611
25	37.392	10.567	26.825	17.436	313.856	9.389	168.999
26	37.392	10.567	26.825	17.436	331.292	9.389	178.388
27	37.392	10.567	26.825	17.436	348.729	9.389	187.777
28	37.392	37.392	24.305	373.034	13.087	200.864	
29	37.392	37.392	24.305	397.339	13.087	213.952	
30	37.392	37.392	24.305	421.644	13.087	227.039	
31	37.392	37.392	24.305	445.949	13.087	240.126	
32	37.392	37.392	24.305	470.254	13.087	253.214	
33	37.392	37.392	24.305	494.559	13.087	266.301	
34	37.392	37.392	22.713	517.272	14.630	280.931	

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DATL: 81-044: TIME: 12134115.31 CPU TIME: 0000.7 SEC
 READY

VBASIC FRPV 1
DATE: 81-044: TIME: 10:55:35.91 PROG: FRPV5
FILE: 1=REG. 2=ESC.
?
2

HLGW-DOE 1981 \$8.00 ESCALATED, S.F. @ 90%

1981/02/13

	INVESTH.	GOVERNH.	CUM.	MEMPHIS	CUMUL.	ESCROW	CUMUL.	INT.ESC.	INT.DEBT	DIFF.	CUM.	ESCROW +
1	82.000-	82.000	82.000			17.000	17.000	2.550	1.445	1.105	1.105	18.105
2	109.000-	109.000	191.000			21.800	38.800	5.985	3.298	2.688	3.793	42.593
3	220.000-	220.000	411.000			44.000	82.800	12.989	7.038	5.951	9.744	92.544
4	150.000-	150.000	561.000			17.200	100.000	16.462	8.500	7.962	17.705	117.705
5	81.000-		561.000	81.000	81.000		100.000	5.506	8.500	2.994	14.711	33.711
6	80.000-	60.108	621.107	19.892	100.892		100.000	2.073	8.500	6.427-	8.284	7.391
7	75.000-	75.000	696.107		100.892		100.000	1.109	8.500	7.391-	.892	

	CASHFLOW	DEBT	NET	GOVT.	CUMUL.	MEMPHIS	CUMUL.
8	118.470	10.567	107.903	26.501	26.501	81.402	81.402
9	131.473	10.567	120.906	26.501	53.003	94.405	175.806
10	145.869	10.567	135.302	26.501	79.504	108.800	284.606
11	161.804	10.567	151.237	26.501	106.005	124.736	409.342
12	179.441	10.567	168.874	26.501	132.506	142.372	551.715
13	198.958	10.567	188.391	26.501	159.008	161.889	713.604
14	220.552	10.567	209.985	26.501	185.509	183.484	897.089
15	244.442	10.567	233.875	26.501	212.010	207.379	1,104.461
16	270.867	10.567	260.300	26.501	238.512	233.799	1,338.260
17	300.094	10.567	289.527	26.501	265.013	263.025	1,601.285
18	332.414	10.567	321.847	26.501	291.514	295.346	1,896.631
19	368.151	10.567	357.584	26.501	318.016	331.063	2,227.714
20	407.662	10.567	397.095	26.501	344.517	370.594	2,598.307
21	451.339	10.567	440.772	26.501	371.018	414.271	3,012.578
22	499.617	10.567	489.050	26.501	397.519	462.549	3,475.127
23	552.974	10.567	542.407	26.501	424.021	515.906	3,991.033
24	611.939	10.567	601.372	26.501	450.522	574.671	4,565.904
25	677.094	10.567	666.526	26.501	477.023	640.025	5,205.929
26	749.080	10.567	738.513	26.501	503.525	712.012	5,917.941
27	828.608	10.567	818.041	26.501	530.026	791.540	6,709.481
28	916.458		916.458		530.026	916.458	7,625.939
29	1013.492		1013.492		530.026	1013.492	8,639.431
30	1120.661		1120.661		530.026	1120.661	9,760.092
31	1239.012		1239.012		530.026	1239.012	10,999.104
32	1369.701		1369.701		530.026	1369.701	12,368.805
33	1514.001		1514.001		530.026	1514.001	13,882.806
34	1673.319		1673.319		530.026	1673.319	15,556.125

DATE: 01-04-81 TIME: 11:04:28.01 CPU TIME: 0000.7 SEC

MLGW-DOE 1981 \$8.00 ESCALATED, S.F. @ 30%

1981/02/13

	INVESTM.	GOVERN.	CUM.	MEMPHIS	CUMUL.	ESCROW	CUMUL.	INT.ESC.	INT.DEBT	DIFF.	CUM.	ESCROW +
1	82,000-	82,000	82,000			17,000	17,000	2,550	1,445	1,105	1,105	18,105
2	109,000-	109,000	191,000			21,800	38,800	5,986	3,298	2,688	3,793	42,593
3	220,000-	220,000	411,000			44,000	82,800	12,989	7,038	5,951	9,744	92,544
4	150,000-	150,000	561,000			17,200	100,000	16,462	8,500	7,962	17,705	117,705
5	81,000-		561,000	81,000	81,000		100,000	5,506	8,500	2,994-	14,711	33,711
6	80,000-	60,108	621,107	19,892	100,892		100,000	2,073	8,500	6,427-	8,284	7,391
7	75,000-	75,000	696,107		100,892		100,000	1,109	8,500	7,391-	.892	
	CASHFLOW	DEBT	NET	GOVT.	CUMUL.	MEMPHIS	CUMUL.					
8	101,023	10,567	90,456	26,441	26,441	64,015	64,015					
9	112,239	10,567	101,672	26,441	52,883	75,230	139,245					
10	124,665	10,567	114,098	26,441	79,324	87,657	226,902					
11	138,430	10,567	127,863	26,441	105,766	101,422	328,324					
12	153,676	10,567	143,108	26,441	132,207	116,667	444,991					
13	170,558	10,567	159,991	26,441	158,649	133,549	578,540					
14	189,249	10,567	178,682	26,441	185,090	152,241	730,781					
15	209,941	10,567	199,374	26,441	211,532	172,932	903,713					
16	232,843	10,567	222,276	26,441	237,973	195,834	1,099,547					
17	258,189	10,567	247,621	26,441	264,414	221,179	1,320,727					
18	286,232	10,567	275,665	26,441	290,856	249,223	1,569,950					
19	317,259	10,567	306,691	26,441	317,297	280,250	1,850,200					
20	351,580	10,567	341,013	26,441	343,739	314,572	2,164,772					
21	389,542	10,567	378,974	26,441	370,180	352,533	2,517,305					
22	431,523	10,567	420,956	26,441	396,622	394,515	2,911,820					
23	477,946	10,567	467,379	26,441	423,063	440,937	3,352,757					
24	529,272	10,567	518,705	26,441	449,505	492,263	3,845,020					
25	586,013	10,567	575,446	26,441	475,946	549,004	4,394,024					
26	648,733	10,567	638,166	26,441	502,388	611,725	5,005,749					
27	718,055	10,567	707,488	26,441	528,829	681,047	5,686,796					
28	794,665		794,665		528,829	794,665	6,481,461					
29	879,321		879,321		528,829	879,321	7,360,782					
30	972,857		972,857		528,829	972,857	8,333,639					
31	1076,195		1076,195		528,829	1076,195	9,409,834					
32	1190,351		1190,351		528,829	1190,351	10,600,184					
33	1316,445		1316,445		528,829	1316,445	11,916,630					
34	1455,714		1455,714		528,829	1455,714	13,372,344					

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DATE: 01-04-81 TIME: 11:04:28.01 CPU TIME: 0000.7 SEC
READY

MLGW-DOE 1981 \$9.00 CONSTANT, S.F., @ 90%

1981/02/13

	INVEST.	GOVERN.	CUM.	MEMPHIS	CUMUL.	ESCROW	CUMUL.	INT.ESC.	INT.DEBT	DIFF.	CUM.	ESCROW +
1	82.000-	82.000	82.000			17.000	17.000	2.550	1.445	1.105	1.105	18.105
2	109.000-	109.000	191.000			21.800	38.800	5.986	3.298	2.688	3.793	42.593
3	220.000-	220.000	411.000			44.000	82.800	12.989	7.038	5.951	9.744	92.544
4	150.000-	150.000	561.000			17.200	100.000	16.462	8.500	7.962	17.705	117.705
5	81.000-		561.000	81.000	81.000		100.000	5.506	8.500	2.994	14.711	33.711
6	90.000-	60.108	621.107	19.892	100.892		100.000	2.073	8.500	6.427	8.284	7.391
7	75.000-	75.000	696.107		100.892		100.000	1.109	8.500	7.391-	.892	

	CASHFLOW	DEBT	NET	GOVT.	CUMUL.	MEMPHIS	CUMUL.
8	56.728	10.567	46.161	25.916	25.916	20.245	20.245
9	56.728	10.567	46.161	25.916	51.833	20.245	40.490
10	56.728	10.567	46.161	25.916	77.749	20.245	60.735
11	56.728	10.567	46.161	25.916	103.665	20.245	80.980
12	56.728	10.567	46.161	25.916	129.582	20.245	101.225
13	56.728	10.567	46.161	25.916	155.498	20.245	121.470
14	56.728	10.567	46.161	25.916	181.414	20.245	141.715
15	56.728	10.567	46.161	25.916	207.331	20.245	161.960
16	56.728	10.567	46.161	25.916	233.247	20.245	182.205
17	56.728	10.567	46.161	25.916	259.163	20.245	202.450
18	56.728	10.567	46.161	25.916	285.080	20.245	222.694
19	56.728	10.567	46.161	25.916	310.996	20.245	242.939
20	56.728	10.567	46.161	25.916	336.913	20.245	263.184
21	56.728	10.567	46.161	25.916	362.829	20.245	283.429
22	56.728	10.567	46.161	25.916	388.745	20.245	303.674
23	56.728	10.567	46.161	25.916	414.662	20.245	323.919
24	56.728	10.567	46.161	25.916	440.578	20.245	344.164
25	56.728	10.567	46.161	25.916	466.494	20.245	364.409
26	56.728	10.567	46.161	25.916	492.411	20.245	384.654
27	56.728	10.567	46.161	25.916	518.327	20.245	404.899
28	56.728		56.728		518.327	56.728	461.627
29	56.728		56.728		518.327	56.728	518.356
30	56.728		56.728		518.327	56.728	575.084
31	56.728		56.728		518.327	56.728	631.813
32	56.728		56.728		518.327	56.728	688.541
33	56.728		56.728		518.327	56.728	745.269
34	56.728		56.728		518.327	56.728	801.998

312

DATE: 81-0441 TIME: 09129100.01 CPU TIME: 0000.6 SEC
E

MLGW-DUE 1981 \$8.00 CONSTANT, S.F., @ 80%

1901/02/13

	INVESTM.	GOVERN.	CUM.	MEMPHIS	CUMUL.	ESCRON	CUMUL.	INT.ESC.	INT.DEBT	DIFF.	CUM.	ESCRON +
1	82.000-	82.000	82.000			17.000	17.000	2.550	1.445	1.105	1.105	18.105
2	109.000-	109.000	191.000			21.800	38.800	5.986	3.298	2.688	3.793	42.593
3	220.000-	220.000	411.000			44.000	82.800	12.989	7.038	5.951	9.744	92.544
4	150.000-	150.000	561.000			17.200	100.000	16.462	8.500	7.962	17.705	117.705
5	81.000-		561.000	81.000	81.000		100.000	5.506	8.500	2.994-	14.711	33.711
6	80.000-	60.109	621.107		19.892		100.892	2.073	8.500	6.427-	8.284	7.391
7	75.000-	75.000	696.107		100.892		100.000	1.109	8.500	7.391-	.692	

	CASHFLOW	DEBT	NET	GOVT.	CUMUL.	MEMPHIS	CUMUL.
8	47.926	10.567	37.359	24.283	24.283	13.076	13.076
9	47.926	10.567	37.359	24.283	48.567	13.076	26.151
10	47.926	10.567	37.359	24.283	72.850	13.076	39.227
11	47.926	10.567	37.359	24.283	97.133	13.076	52.302
12	47.926	10.567	37.359	24.283	121.416	13.076	65.378
13	47.926	10.567	37.359	24.283	145.700	13.076	78.454
14	47.926	10.567	37.359	24.283	169.983	13.076	91.529
15	47.926	10.567	37.359	24.283	194.266	13.076	104.605
16	47.926	10.567	37.359	24.283	218.550	13.076	117.681
17	47.926	10.567	37.359	24.283	242.833	13.076	130.756
18	47.926	10.567	37.359	24.283	267.116	13.076	143.832
19	47.926	10.567	37.359	24.283	291.399	13.076	156.907
20	47.926	10.567	37.359	24.283	315.683	13.076	169.983
21	47.926	10.567	37.359	24.283	339.966	13.076	183.059
22	47.926	10.567	37.359	24.283	364.249	13.076	196.134
23	47.926	10.567	37.359	24.283	388.533	13.076	209.210
24	47.926	10.567	37.359	24.283	412.816	13.076	222.285
25	47.926	10.567	37.359	24.283	437.099	13.076	235.361
26	47.926	10.567	37.359	24.283	461.382	13.076	248.437
27	47.926	10.567	37.359	24.283	485.666	13.076	261.512
28	47.926		47.926	25.886	511.551	22.040	283.553
29	47.926		47.926	6.160	517.711	41.768	325.319
30	47.926		47.926		517.711	47.926	373.245
31	47.926		47.926		517.711	47.926	421.171
32	47.926		47.926		517.711	47.926	469.097
33	47.926		47.926		517.711	47.926	517.023
34	47.926		47.926		517.711	47.926	564.949

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DATE: 81-0441 TIME: 09:36:13.91 CPU TIME: 0000.7 SEC
READY

MLGW-DOE 1991 \$8.00 CONSTANT, S.F., UPTO 80%

1991/02/13

	INVESTM.	GOVERN.	CUM.	MEMPHIS	CUMUL.	ESCROW	CUMUL.	INT.ESC.	INT.DEST	DIFF.	CUM.	ESCROW +
1	82.000-	82.000	82.000			17.000	17.000	2.550	1.445	1.105	1.105	18.105
2	109.000-	109.000	191.000			21.800	38.800	5.936	3.298	2.688	3.793	42.593
3	220.000-	220.000	411.000			44.000	82.800	12.969	7.038	5.951	9.744	92.544
4	150.000-	150.000	561.000			17.200	100.000	16.462	8.500	7.962	17.705	117.705
5	81.000-		561.000	81.000	91.000		100.000	5.506	8.500	2.994-	14.711	33.711
6	80.000-	60.108	621.107	19.892	100.892		100.000	2.073	8.500	6.427-	8.284	7.391
7	75.000-	75.000	696.107		100.892		100.000	1.107	8.500	7.391-	.892	

	CASHFLOW	DEBT	NET	GOVT.	CUMUL.	MEMPHIS	CUMUL.
8	21.519	10.567	10.952	7.119	7.119	3.833	3.833
9	30.321	10.567	19.754	12.840	19.959	6.914	10.747
10	39.124	10.567	28.556	18.562	38.520	9.995	20.742
11	47.926	10.567	37.359	24.283	62.804	13.076	33.817
12	47.926	10.567	37.359	24.283	87.087	13.076	46.893
13	47.926	10.567	37.359	24.283	111.370	13.076	59.969
14	47.926	10.567	37.359	24.283	135.654	13.076	73.044
15	47.926	10.567	37.359	24.283	159.937	13.076	86.120
16	47.926	10.567	37.359	24.283	184.220	13.076	99.195
17	47.926	10.567	37.359	24.283	208.503	13.076	112.271
18	47.926	10.567	37.359	24.283	232.787	13.076	125.347
19	47.926	10.567	37.359	24.283	257.070	13.076	138.422
20	47.926	10.567	37.359	24.283	281.353	13.076	151.498
21	47.926	10.567	37.359	24.283	305.637	13.076	164.574
22	47.926	10.567	37.359	24.283	329.920	13.076	177.649
23	47.926	10.567	37.359	24.283	354.203	13.076	190.725
24	47.926	10.567	37.359	24.283	378.486	13.076	203.800
25	47.926	10.567	37.359	24.283	402.770	13.076	216.876
26	47.926	10.567	37.359	24.283	427.053	13.076	229.952
27	47.926	10.567	37.359	24.283	451.336	13.076	243.027
28	47.926		47.926	25.886	477.222	22.040	265.068
29	47.926		47.926	25.886	503.107	22.040	287.108
30	47.926		47.926	14.604	517.711	33.322	320.431
31	47.926		47.926		517.711	47.926	368.357
32	47.926		47.926		517.711	47.926	416.283
33	47.926		47.926		517.711	47.926	464.209
34	47.926		47.926		517.711	47.926	512.135

vsbasic pppvs 1
DATE: 81-0441 TIME: 10:02:43.81 PROG: PRPV5
FILE: 1=REQ. 2=ESC.

MLGW-DOE 1981 \$6.00 CONSTANT, S.F., UPTO 90%

1981/02/13

	INVESTN.	GOVERN.	CUM.	MEMPHIS	CUMUL.	ESCROW CUMUL.	INT.ESC.	INT.DEBT	DIFF.	CUM.	ESCROW +
1	82.000-	82.000	82.000			17.000	17.000	2.550	1.445	1.105	1.105
2	109.000-	109.000	191.000			21.800	38.800	5.986	3.298	2.688	3.793
3	220.000-	220.000	411.000			44.000	82.800	12.989	7.038	5.951	9.744
4	150.000-	150.000	561.000			17.200	100.000	16.462	8.500	7.962	17.705
5	81.000-		561.000	81.000	81.000		100.000	5.506	8.500	2.994-	14.711
6	80.000-	60.108	621.107	19.892	100.892		100.000	2.073	8.500	6.427-	6.284
7	75.000-	75.000	696.107		100.892		100.000	1.109	8.500	7.391-	.892

	CASHFLOW	DEBT	NET	GOVT.	CUMUL.	MEMPHIS	CUMUL.
8	21.519	10.567	10.952	7.119	7.119	3.833	3.833
9	30.321	10.567	19.754	12.840	19.959	6.914	10.747
10	39.124	10.567	28.556	18.562	38.520	9.995	20.742
11	47.926	10.567	37.359	24.283	62.804	13.076	33.817
12	56.728	10.567	46.161	25.886	88.689	20.276	54.093
13	56.728	10.567	46.161	25.886	114.575	20.276	74.369
14	56.728	10.567	46.161	25.886	140.460	20.276	94.645
15	56.728	10.567	46.161	25.886	166.346	20.276	114.920
16	56.728	10.567	46.161	25.886	192.232	20.276	135.196
17	56.728	10.567	46.161	25.886	218.117	20.276	155.472
18	56.728	10.567	46.161	25.886	244.003	20.276	175.748
19	56.728	10.567	46.161	25.886	269.889	20.276	196.023
20	56.728	10.567	46.161	25.886	295.774	20.276	216.299
21	56.728	10.567	46.161	25.886	321.659	20.276	236.575
22	56.728	10.567	46.161	25.886	347.545	20.276	256.851
23	56.728	10.567	46.161	25.886	373.430	20.276	277.126
24	56.728	10.567	46.161	25.886	399.316	20.276	297.402
25	56.728	10.567	46.161	25.886	425.201	20.276	317.678
26	56.728	10.567	46.161	25.886	451.087	20.276	337.954
27	56.728	10.567	46.161	25.886	476.973	20.276	358.229
28	56.728		56.728	25.886	502.858	30.843	389.072
29	56.728		56.728	14.853	517.711	41.876	430.948
30	56.728		56.728		517.711	56.728	487.676
31	56.728		56.728		517.711	56.728	544.405
32	56.728		56.728		517.711	56.728	601.133
33	56.728		56.728		517.711	56.728	657.861
34	56.728		56.728		517.711	56.728	714.590

DATE: 81-0441 TIME: 10:04:42.91 CPU TIME: 0000.7 SEC
READY

Mr. LOEFFLER. You may proceed.

Mr. HANSEN. Thank you, sir.

My name is David F. Hansen and I am President and Chief Executive Officer of the Memphis Light, Gas and Water Division. It is a pleasure to be here with you again today.

I last testified before this committee on March 19, 1979, about the Memphis industrial gas plant and since that time the project has had an excellent progress. Memphis signed a contract with the Federal Government, Department of Energy, to proceed to construction on May 21, 1980. The Environmental Impact Statement is completed and is in printing now. We should be able to start construction in the early spring. Memphis is looking forward to fulfilling its part of the contract and we hope the Federal Government will do likewise.

We do have some current difficulty. The Federal administration is apparently making recommendations on the future conduct of the synfuels development program with little time to carefully evaluate the merits of each project or review the overall position of the program relative to national defense and energy independence. All projects are seemingly viewed as similar in technical and economic risk. The hard work and sizable investments over the past four administrations to nurture synfuels in order to effectively tap our tremendous indigenous coal reserves may be in jeopardy.

As of today the Memphis project is the premier synfuels development project in the Nation. We have a contract. We have a successful environmental review. We are, at last, ready to build.

Mr. LOEFFLER. How much money have you expended from your own funds?

Mr. HANSEN. We have a million dollars in escrow now and the contract calls for another \$100 million during the progress of the plant construction. The Memphis contract requires another \$50 million on our part to build the synthetic industrial fuel pipelines and also to develop the storage capability and the National Gas System to build credits and to even out the load factor of the plant. We are running in tandem and we are interchanging. When the plant has greater capacity than the market demand, it will generate credits. When the market requires a greater market, we will pull out so we can operate on about a 1985 load factor.

Mr. LOEFFLER. How much money has been expended so far?

Mr. HANSEN. About \$12 million.

Mr. LOEFFLER. What would be the outcome in the event there is Federal money?

Mr. HANSEN. Well, the plant would stop. This is a new second generation technology. We cannot finance in the private marketplace with new generation technology of such magnitude. We have pledged the entire earnings power of a complete national gas system as our share of this plan. We probably have 100 times more equity investment in the project than any other synthetic fuels project underway. Our natural gas plant is \$131 million at original cost. We have only \$8 million for indebtedness, it is practically debt free. We hocked the whole thing to put up our share, we were that confident.

The pilot plant has operated beautifully. The risk factor is a factor of 10 going into commercial operations.

PILOT PLANT COST

We estimate the plant will cost \$700 million. The DOE contribution would be \$700 million, we would be putting in \$150 million. The risk factor really is a year or two delay in getting the plant up and operating on load factor as anticipated. When you make a \$7 million investment, you have a 10 percent cost of money. You are talking about \$7 million and in Memphis one cannot raise that kind of capital in the private sector because of the new technology. Secondly, Memphis cannot afford a \$7 million negative cash flow per year if it does take it over a prolonged period.

Incidentally, that was gasification. We chose this particular one because it is the lowest temperature, lowest pressure, most forgiving technology available. In other words, we have a significant investment. We want to have a plant that works and this looks to us like the least risk way to do it. The benefits of this plant are tremendous.

Another problem we are having is the administration who I understand is very busy trying to do a lot of things at once and saying we had not placed technology. This technology will be required to demonstrate so that we can successfully build future plants with private capital.

Mr. LOEFFLER. What would you anticipate the payback capacity to be both in dollars and in time?

Mr. HANSEN. What would you like to talk about, the cash flow to the Federal Treasury or the financial strength of the plant?

Mr. LOEFFLER. Touch on both.

Mr. HANSEN. Our plan calls for payback after a period of 20 years, seven years for building and shakedown and then a 20 year payback. We have run performance on several different ones, one at the 80 percent load factor capacity in the second year. It is a solid financial winner to both partners if the plant operates as projected under any circumstance. We are talking on the base case of \$8 a million Btu output escalated at eight percent with a service factor of 90 percent.

After paying the operating cost to Memphis of \$10 million, after paying the \$6 million in taxes, after paying back the Government \$26 million, this plant could well throw off the extra \$81 million. If we take it a little more conservatively, we could hit an 80 percent service factor if the excess is \$64 million the first year and \$75 million the second year.

In terms of cash flow to the U.S. Treasury, this figure of a low contribution of \$697 million, this took the 1978 performance in Phase 1 upon which we signed a contract and escalated them 20 percent to get them up to February 1981 and then escalate the cost through construction, 10 percent per year for capital oriented costs and eight percent for other costs.

Also, there is a 25 percent contingency factor on the total construction price of the plant that was requested by DOE. That brings it to a DOE grand total contribution of \$698 million. By the time the plant is built in 1986, the Federal Government will have received back to the tax spinoffs on its investment \$518 million. In other words, the cash flow to the U.S. Treasury will be less than \$200 million. At that time the plant will start paying back the total investment from the beginning of Phase 2, returning 100 percent of the capital to the Federal Government which is 10.3 percent.

Mr. LOEFFLER. Why haven't the lending institutions been interested in this? It does not sound like a bleak picture.

Mr. HANSEN. No. We have gone to our financial analyst and on new technology if you don't get on-line for a couple of years, you are going to pay part of the carrying cost of the plant. Even the Great Lakes is having difficulty. The only sure way they could get the capital was as the backup for that credit and that was thrown out in court and now they are trying to work up another arrangement.

The basic problem was the private financial markets as you have to assure those people that you are going to pay back those bonds and you are looking for them and they are looking for a secure source. Basically, just like nuclear energy, there is absolutely no way you can touch the capital market. We would prefer not to be partners with the Federal Government. We think it will cost us \$100 billion to build this plant because of the complexity of the dual management system.

Incidentally, this project has another interesting factor. It is the only urban center synfuels project projected for this country and it will demonstrate several things. First off, it will cost us only two-thirds as much to convert it to 300 BTUs as to go up to the pipeline in Beulah, North Dakota. So we have a substantial economic advantage right off the bat in just the cost to produce the product. Secondly, it is in the urban center where we already have our roads, buildings, businesses and labor. We are not faced with a boom town in the middle of the Mojave somewhere if the economics are astronomical. We are talking about during construction 2,000 jobs, hard jobs, plus the escalation factor. During the operation of the plant this will provide approximately 9,500 full time jobs and have a \$2.2 billion economic impact on the Memphis economy and what it will do for the Memphis tax base is unreal.

Each \$100 million of investment in Memphis today is equivalent to 6.5 percent of the present residential tax base in Memphis. If we are talking about a \$700 million plant, you are talking about a transfusion equal to between 40 and 50 percent of the total residential tax base of Memphis. If they get production machinery like that going, they won't need you guys, the community will be able to handle the problems themselves.

In addition, this type of marketing structure running the commercial gas plants and with the natural gas system and storing the natural gas is about one-tenth the cost of storing liquids on the surface so it is the most inexpensive way we know. This is applicable in 79 communities in this country that can't provide up to seven quads. This marketing analysis was done without even assuming there would be a partial method for taking part of the product up to pipeline quality in order to smooth the load factor so in this particular demonstration plant we are building that will operate between 10 and 30 percent. We wish we could finance it through the private investment capital business.

Mr. LOEFFLER. You have, of course, been in touch with a Congressman.

Mr. HANSEN. We have a difficult problem in this country when something has to be done. The difficulty we have is telling the present administration this is a different animal than the other

synfuel plants; it is done, we have a contract, it is an economic payout, we have a mix of substantial investment. If you kill this one, you are going to throw out the baby with the bath water basically. It is not making that big a drag on the currency in terms of cash flow to it.

Mr. LOEFFLER. Thank you.

Mr. HANSEN. Thank you.

Mr. LOEFFLER. Is a representative from the National Energy Organizing Network here?

Is Elliott Jacobson here?

[The scheduled witness did not appear.]

ENVIRONMENTAL POLICY CENTER

DOE BUDGET—FOSSIL ENERGY

WITNESS

ROBERT ROACH, WASHINGTON REPRESENTATIVE, ENVIRONMENTAL POLICY CENTER

Mr. LOEFFLER. The Environmental Policy Center, Mr. Roach.

Mr. ROACH. I want to thank you for the opportunity to come here and testify.

Mr. LOEFFLER. Without objection, your prepared statement will appear in the record at this point.

[Material follows:]

Statement of

Robert Roach

Washington Representative

Environmental Policy Center

I am Robert Roach, Washington Representative of the Environmental Policy Center. The Center is a non-profit, non-partisan environmental lobby organization, which for the past eight years has worked on energy issues with diverse coalitions of citizens throughout the country.

It is a pleasure to appear before you this morning and offer our views on particular aspects of the Department of Energy's Fossil Energy Program.

While I have read Mr. Reagan's remarks of last night, I have not seen details of his proposed cuts. Therefore, in preparing numbers and cost projections for my testimony, I have relied upon other governmental documents which were issued and/or publicly discussed earlier: the Carter Administration's FY82 Budget Request, a February 1981 Congressional Budget Office (CBO) study, and the Office of Management and Budget's (OMB) recommendations to President Reagan.

EPC strongly endorses Mr. Reagan's proposal to eliminate funding for the five major synthetic fuel projects currently being funded through the Department of Energy's (DOE) Fossil Energy (FE) program: SRC I (Newman, KY), SRC II (Morgantown, WV), a Medium Btu Synthetic Gas Plant (Memphis, TN) and two High Btu Gasification Plants (Noble County, Ohio and Perry County, Illinois). I am here today to ask you and the other members of the Subcommittee to support the President's proposal.

These programs represent an enormous drain on FE funds, and are likely to be so for several years. The Carter Administration's FY82 request for only three of these projects (SRC I, SRC II and Memphis) consumed \$802 million, which was 51.71 of FE's entire 1982 Budget Request. Additionally, DOE was in the process of preparing a FY82 supplemental request for the two High Btu plants.

Through 1981, those five projects have received a total of \$870.3 million in appropriations. Budget projects indicate that a total commitment of at least \$3.02 billion will be necessary to complete the SRC I, SRC II and the Memphis programs. By my estimates, this total will escalate by at least \$1 billion with the addition of the two High Btu gas projects.

A table summarizing these costs is appended to my statement.

It has always been the opinion of EPC that the government's role with respect to the Synthetic Fuels industry should involve continual research on the externalities of various processes (including collection of base data) and increasing capability through programs aimed at demonstrating the technical feasibility of advanced technologies. EPC did not endorse the creation of the Synthetic Fuels Corporation. However, now that the Corporation does exist to provide commercial ventures with financial assistance, it seems even more important that the FE Program does not divert its funds to support the construction of large scale plants. In a time of restricted financial resources, new capacity will only be added at the expense of new capability. Once technical capability is demonstrated, the private sector should assume responsibility for large scale demonstration and commercialization.

A similar sentiment has been expressed by the CBO. Earlier this month, it issued a report entitled: Reducing the Federal Budget: Strategies and Examples, Fiscal Years 1982-1986. In discussing DOE funding of the five synthetic fuel projects, the report noted:

Such demonstration plants may assist in eliminating technological uncertainties that deter private investment in full-scale synthetic fuel plants. Yet they need not be funded through the DOE budget. There is reason to believe that sufficient private capital is available in the energy industry to develop new energy technologies. Moreover, the funding of any technology through DOE undermines the competition among technologies for fixed funds within the Synthetic Fuels Corporation, and reduces the long-term effectiveness of federal expenditures to develop synthetic fuels production. (p. 46)

With respect to the projects under discussion today, the scale of most of these projects, especially SRC I and SRC II, are larger than is necessary to demonstrate technical feasibility and therefore should be funded by private sources.

Two engineering studies done on the SRC II project recommended that the demonstration plant be designed with a capacity smaller than the two 3350 TPD reactors currently planned. One study recommended a 750 TPD reactor, the other a 1500 TPD reactor. In recommending a 750 TPD train, Badger Energy, Inc., made the following observations:

We view the principal technical requirement of the demonstration plant to be to establish a firm basis upon which to move ahead with succeeding and larger plant designs. This need not be done at the exact train capacity of the succeeding designs since some degree of scale-up from the demonstration plant would involve little risk. Therefore, a 750 to 1000 TPSD train would be sufficient to demonstrate the feasibility of a 3350 TPSD train and, more importantly, to provide a data base on which to design the larger train.

A smaller scale reactor would reduce the cost of the project, decrease procurement time, and still provide industry with much of the information it needs to make a decision on commercialization.

Oftentimes the questions surrounding a demonstration project involve economic feasibility as much as technical viability. However, it would seem that economic viability is a question which should be left to private industry. After all, to be faced with proven technical capability and uncertain economic feasibility is not unique to the synthetic fuels industry. Of course, with synthetic fuels, the fear is that with costs about at the margin, economic uncertainty would delay private investment and further set back the development of a full-fledged industry. However, if a particular technology is going to take more than indirect supports, if it is going to require massive infusions of direct subsidies, perhaps that particular technology is not ready to be commercialized. Perhaps in such a situation, the Synthetic Fuel Corporation, which requires a greater portion of private financing is a better

barometer of a technology's readiness and appeal.

Additionally I believe R & D can produce more results by exploring a wide range of technologies rather than intensively cultivating a few. The latter approach logically favors older, existing technologies. Combined with a limited money supply, the result is less attention to other technologies.

Another factor important to these demonstration projects is the process employed. One important issue is the mix of fuels produced. This is an issue which involves not only marketing, but national security as well. With a limited amount of money available, choices on end products must be made. The primary goal should be transportation fuels. This is the crux of our energy problem, because the rich, sweet crude which provides us with more of the higher fractions needed for transportation is controlled by a small number of countries. Residuals and diesel fuels can be obtained from a wider range of sources and therefore our potential sources of supply are not as constrained. To attempt to use the synthetic fuels industry with its inherently long lead time to give us a broad mix of fuels may not be as effective a strategy at this time.

Even the most optimistic views of the synthetic fuels industry project production of about 2 mmbd by the year 2000. Therefore, unless there is a great surge in conservation, we can expect to continue imports for quite some time. Given this situation, it would seem that the best strategy would be to focus on technologies which will yield those higher fraction products, the supplies of which are most limited.

Many of the fuels produced by these five plants--solids, heavier fractions, and medium Btu gas--are neither supply constrained nor vulnerable to supply interruptions. Given the prospect of a relatively small synthetic fuels industry for many years, it might be beneficial to focus more attention upon the strategically important and most vulnerable fuels.

In conclusion, the FY82 appropriations represent a watershed for many of the demonstration projects. They are now at the stage where construction is about to begin. The Environmental Policy Center does not believe the Federal Government should make the enormous financial commitments required to construct and operate these plants. We must avoid reaching the "Point of No Return" where, as with many water projects, large investments alone are eventually used to justify continued support for a project.

PROJECT FUNDING

	Appropriations through FY81	Carter Administration's FY82 Requests	Total Project	
			Federal ¹	Non-Federal
SRC I	262.5	507.4	1607.4	120
SRC II	292	152	784.5	654.5
Medium Btu Gasification	127.8	142.8	629.0 ²	100
High Btu Gasification	188	0 ³	-- ⁴	-- ⁴

All figures in millions of dollars.

1. Figure represents U.S. Government share of Project costs and includes Facility Construction Costs (design, procurement, plant and capital equipment, and construction), other Project costs (monitoring, analysis, training, start-up and commissioning) and Operations (operation of plant and any sales revenue).
2. Does not include \$31 million per year in other related annual funding costs during life of Project (estimated at 20 months).
3. The Carter Administration planned to submit a supplemental appropriations request.
4. Total costs have not yet been computed.

Mr. LOEFFLER. You may proceed.

OPENING REMARKS

Mr. ROACH. I would like to start out saying that the Environmental Policy Center strongly endorses Mr. Reagan's proposal to eliminate the funding for the demonstration budget. Specifically, he says one plant and two high Btu gasification plants.

I am here today to ask you and other Members to support this proposal as well. We feel that these projects have been an enormous strain on the fossil energy budget. Three projects—SRC-I, SRC-II and the Memphis plant—have a Carter administration proposal for this year and have requests following \$802 million which is over 51 percent of the fossil budget. All three of these projects through fiscal year 1981 have received a total of \$8.3 million and the total projected cost for the three plants—SRC-I, SRC-II and Memphis—as projected by the Department of Energy will cost the Federal Government a little over \$3 billion.

I have attached a little chart on the final page of my statement of those costs. There are no costs right now for the gasification plants because the decision was made to go forward with the programs. When I was talking to some project people over at DOE, we were still working on the projections.

Sir, the EPC views our opinion as that the Government role with respect to synthetics should focus on increasing capability through projects aimed at demonstrating feasibility of the finance technology as well as research on monitoring human base line data. We feel that that is the proper place for the fossil energy. We did not endorse the Synthetic Fuels Corporation but now that it is in existence and is there to provide capital for commercial ventures with financial assistance, we feel that it is more important that fossil energy is not used for the construction of large-scale demonstration plants particularly in this time of restricted resources.

We feel that large efforts at building new capacity will take away from the money that is available for developing new capabilities. We feel that once the technical capability of a technology has been proven the private sector should assume responsibility for large-scale demonstration and commercialization.

The Congressional Budget Office issued a study and the final analysis was that while the money spent here is probably helpful in eliminating some uncertainties, the projects do not have to be funded through the DOE. Folks at CBO believe that there is sufficient private capital to support these projects but most important is their belief that funds go through no source until it is found what the competition is and whether it will ultimately lessen the effectiveness of Federal expenditures.

Now with respect to these five projects, the scale for two of these, especially SRC-I and SRC-II, is a lot larger than is needed to demonstrate technical feasibility. As an example, two engineering studies on the SRC-II projects done by two contracting firms recommended smaller demonstrations, than the 3,350 ton reactors. One study recommended 750 and another recommended 1500 be used. If such sizes were used, it was the opinion of one of the contractors that it would decrease procurement time and still make final decisions whether or not to go to some more talks.

The other issue involved here, I think, is that oftentimes the question that really predominates these demonstration programs is

one of economic feasibility. In fact, sometimes it is even more important than the technical. I think a lot of us believe that this is a question which should be left in private industry. In many instances without the synthetic fuels industry, investors are faced with a situation where there are prudent technologies and economic uncertainties, yet they are left to make the decision on whether or not to go forward.

Now I realize that there is a question with respect to the synthetic fuels industry that with cost being right on the margin the economic uncertainty will perhaps delay with private industry. However, I would ask you to consider that the technology seems to be effective and this technology needs more than direct commercial supports and requires a NASA infusion of direct subsidies and perhaps it should not be commercialized. I think again in this case since we do have the Synthetic Fuels Corporation it should know whether or not these projects are feasible.

The decision of the industry to go forward to the corporation with a proposal involves a commitment which will retail some kind of view and analysis and the corporation's decision on whether or not to support the project would then evolve another analysis of the program. Additionally, I think that more accent on R&D as opposed to coaxing a little attention on what one wants would provide us with better results by providing us a better technology. There is the desire to go forward right away and therefore less attention would be given to third generation technologies which were promising.

Another thing is the mix of fuels which are produced by these technologies. I think this involves not only marketing but an issue of national security. With limited money it is important for us to make choices on end products, and the primary goal of these synthetic fuels should be transportation fuels. Most products are controlled by a few countries and some of these are very unstable. Residual and diesel fuel could be taken from a wide range of sources, so our sources are not as limited, not as contained.

It seems to me we should concentrate our efforts on producing those kinds of options which would give us the most mobility in the international world market. We have to remember that even the most optimistic view of the synthetic fuels industry projects that we would have perhaps two million barrels a day by the year 2000. That means that we are going to be importers of oil for quite a long time unless we make some new, large discovery or unless conservation really takes off. So it seems to me that if we have to choose what type of products we are going to import, we should make sure that the most vulnerable ones are the ones that are insured first and that again transportation follows.

Now much of the fuel produced by these five processes are solids, heavier fractions. These are not cycle strength nor are they as vulnerable to supply interruption.

I would like to conclude by pointing out that for a lot of these projects the construction is about to start up, at least it is for the Memphis plan. The request for these three plants alone is almost equal to what has been given to all five of these projects throughout the life of them so I think we face some real critical decisions here. We should not force them to pay for the construction and the

building of the plant. We would urge you to avoid reaching the point of no return in appropriations where the large investments in these projects alone are eventually used to justify their continued support. Thank you.

Mr. LOEFFLER. Thank you, Mr. Roach.

Mr. ROACH. Yes, sir.

CALIFORNIA ENERGY COMMISSION

WITNESS

RUSSELL L. SCHWEICKART, CHAIRMAN, CALIFORNIA ENERGY COMMISSION

Mr. LOEFFLER. California Energy Commission, Mr. Schweickart.

Mr. SCHWEICKART. I am Russell Schweickart, Chairman of the California Energy Commission.

Mr. LOEFFLER. Your prepared statement will appear in the record at this point.

Mr. SCHWEICKART. Thank you.

[Material follows:]

TESTIMONY OF RUSSELL L. SCHWEICKART, CHAIRMAN, CALIFORNIA ENERGY COMMISSION

It is a pleasure to be here today to testify on some of this Administration's new budget proposals in the energy area. As you can understand, we have not had an opportunity to review in depth the specific actions associated with President Reagan's economic message which he delivered last night. Undoubtedly, those measures differ in some respects from the earlier OMB memorandum, which, I understand, is the focus of this hearing. What is important, in our view, is to provide a basic policy context for federal energy programs. It would be foolish to come before you simply to urge against particular reductions in DOE's budget. The President and the Congress have a clear mandate to reduce Federal expenditures and we recognize that energy programs also deserve public scrutiny. In many cases, there are programs which should be eliminated. Others, however, are worthy and in need of tax support.

Rather than argue against specific budget cuts, I would respectfully ask this committee to focus on two critical policy areas. They are (1) the proper role of government in reducing the risk of promising new energy technologies and (2) setting the right priorities to meet national energy objectives as quickly and economically as possible.

In the first case, I am concerned about the philosophy that government should have no role in the commercialization of energy technology. The documents made available to the public are replete with statements that with oil prices decontrolled the private sector will respond with cost-competitive technologies. This concept becomes simplistic if it is stretched too far. It is one thing to refuse to support technologies which will never become cost-effective. In this regard, we applaud Administration's proposals to end many of the subsidies for huge synthetic fuels projects.

Yet, it is quite a different thing for the government to step in and help promising energy technologies over the hurdle of early technical risks. As an example, the Energy Commission, along with the Federal Government, the utilities and others provides funding for an advanced geothermal process demonstration known as the Heber project. The technology involves reinjecting geothermal brine back into the ground after extracting its heat, thus avoiding air and water pollution, corrosion, land subsidence, etc. No entrepreneur would touch this on a production basis right now but a government-industry partnership has emerged to help the utility absorb the risk of this unproven process. Yet this effort is targeted for elimination in the revised budget despite the fact that once demonstrated at commercial scale and without further government support, this technology will open up thousands of megawatts of geothermal potential, not only the California but in many other states as well. It is folly to think that either a utility or an exploration company will fully shoulder the risk of this project, regardless of the price of oil.

Another case in point lies with the alcohol fuels program for automobiles. At the present time the California Energy Commission is conducting the Nation's largest test of pure alcohol fleet vehicles. Domestic auto manufacturers, in response are developing factory production cars capable of burning pure alcohol fuel. We had urged DOE to join our test to expand the impact and to accelerate an industry commitment to non-oil fueled cars. The automakers could pursue this on their own to be sure, but a coordinated government program to help develop markets for these cars is entirely appropriate. It is exactly that kind of government/industry partnership in commercializing new technologies which has pushed Japanese and European manufacturers well beyond us.

Commercialization programs which seek to move a technology into mass production or widespread application should be supported where (A) there are technical risks that made the technology unattractive (B) the benefits are great and (c) no further government assistance will be required after the initial demonstration and test. So I urge this committee to look closely at these programs—many of them, including Heber, can make a tremendous contribution to our energy well-being by displacing oil now.

This brings me to my second point—priorities—and here I may sound somewhat more strident. Based on information we have today, it appears that this Administration is recommending deep cutbacks or total elimination of many conservation and renewable energy programs while simultaneously boosting spending for nuclear breeder reactors and fusion research. Such a proposal is in our view, seriously out of balance. This is *not* a question of whether one is for or against nuclear power—that is the issue. It is a question of national security. We must cut imports of foreign oil *now*, not ten (10), fifteen (15) or twenty (20) years from now. Massive government expenditures on breeders are unlikely to save one drop of oil in this decade. On the other hand, programs which improve the productivity of the energy we use can reduce energy usage—oil, electricity and natural gas—immediately and much more cheaply. To think that decontrol alone will spur conservation is just not correct. Consumers need information and often some impetus to get them to pay the front end costs. The savings are enormous and will buy us time until new energy sources become available. Let me repeat that huge outlays for nuclear breeders will at best continue the awesome subsidies enjoyed by nuclear energy over the years. There are other sources, just as impervious to the whims of foreign governments, which can produce power much sooner and probably at lower cost. We cannot as a nation afford these inverted priorities. We must reduce foreign oil use *now*. This means directing funds to programs which will pay off as soon as possible.

As an example, we understand today that the proposed cuts would reduce the Schools and Hospitals Grant Programs by half. This is an excellent program whereby public institutions can get front-end funding for energy conservation measures. The ultimate savings are enormous. California has augmented Federal Funds with a state loan program. The schools and hospitals program is working well and it was spared from earlier proposed budget actions. This is the type of effort that should be continued.

I hope these brief thoughts have been useful to the committee. The California Energy Commission would be delighted to be of any further assistance.

Mr. LOEFFLER. You may proceed.

Mr. SCHWEICKART. I have not had an opportunity to review in depth the specific recommendations that came out last night in President Reagan's economic message. Nevertheless, I think a basic policy context for Federal energy programs can be commented on at this time and I will point to some very specific concerns that we have in the Energy Commission in California and I think are shared by many others across the Nation.

Rather than talk about specific cuts, what I would like to do is focus on a couple of critical areas. One is the role of the Government in reducing the risk or sharing the risk of promising new technologies which can have a very large impact and, secondly, the issue of establishing priorities in some of the expenditures related to national objectives, both economic and national security.

In the first instance I think the issue of commercialization and demonstration of critical new technologies is one in which there is an appropriate role for sharing between the Government and pri-

vate industry. The concept that a deregulated environment will increase the value of alternative technologies to the point where the product industry will bring in, in a timely way, our very valuable technology is a bit too simplistic. There are real risks that are excellent in bringing in new technologies which even though they are in fact or will be on a commercial basis cost effective, until they get past that first critical demonstration on a commercial scale in many cases the risk is too great for private industry to make the major commitment.

Mr. LOEFFLER. Further defense risk?

Mr. SCHWEICKART. Taking the example of the Imperial Valley of southern California, the technology there is one of bringing hot geothermal brines to the surface in a closed loop, recirculating them down to depth into the reservoir after removing the heat but not exposing them to the environment. The potential for what is called binary cycle geothermal is estimated to be as much as 80 percent of the geothermal in the United States, not just California but also other States, especially in the West.

By and large the geothermal resource in the Nation is comparable to binary cycle technology unlike the geothermal that we are exploiting now in northern California which is dry steam. That is a very limited resource, we are very lucky to have it and very thankful, but it does not get you very far.

There are thousands of megawatts available not only in California but around the western United States. Now that technology has been demonstrated or tested only on a very small scale. Commercial scale plants of 50 megawatts or more are today a scale of about 10 to 1 over what has been done so far on a test basis. No utility today, especially in the capital environment that we are dealing with, is willing to take that risk or able to take that risk nor is the development company able to take that risk to commit to full-scale commercial development without some sharing of the risk.

That program has been supported by DOE up to this point. My understanding is that it is slated for decision in the revised budget proposed last night. We feel that the benefit to the Nation of moving that technology ahead through a partnership of Government and industry, through that first critical commercial-scale demonstration, will allow the Government to step out at the right time in the development and demonstration of that valuable technology. What we are talking about there is \$50 million which I believe is what was committed out of DOE. You are talking about a total program of \$100 million so it is a shared program.

You are talking about something which does not go on ad infinitum into the future. You are talking about a one-time critical demonstration. I think that there are many examples of that kind of technology which has a capability for displacing oil now for producing energy in one useful form or another without further growing dependent on overseas resources, that it is very valuable to distinguish from the kind of ongoing pork barrel sort of subsidy. Nobody has a problem with eliminating those kinds of programs.

Another example would be alcohol programs. I think that many of the large centralized synfuel programs that were an essential element of the previous administration's program were very ques-

tionable and I would not stand up to support them. On the other hand, there are many other programs in synthetic fuels which are extremely important and one is the use of coal through methanol or other pure alcohol use.

We have what I feel is an extremely exciting program that is well supported in California but we have only limited resources that could be applied to the use of pure alcohol fuels to displace oil and transportation and yet this is another area where once again we are talking about a commitment on the part of auto manufacturers and on the part of fuel suppliers to provide non-oil based fuels for transportation. This is the single largest area of fuel use in California and in fact in the Nation in transportation and it is essentially 100 percent dependent upon oil. We get very excited about electricity but it is transportation which takes up 45 percent of end use energy in California and if I look backward we are looking at 100 percent dependency on oil.

Now substitution of alternative fuels in that environment is extremely important in buffering the society from the very serious disruptions that will occur in the next oil crisis that we have. As a result, a near-term limited investment not on the supply side but on incentives on the demand side for pure alcohol vehicles will make a tremendous difference in bringing production options to the public, to fleet operators and eventually to private vehicle operators in providing alternatives to gasoline.

We have the largest fleet of pure alcohol vehicles in the Nation in California now but we are still at the point where although we are working with U.S. auto manufacturers and not converted vehicles but factory designed, modified vehicles for methanol use, it will take a commitment of several thousand vehicles before the manufacturers will be able to go to the production line option which will bring the cost down to the same level as gasoline-powered engines. Technologically there is not that much difference, it is a matter of materials to take advantage of the fuel.

On a production basis the Government has no business in the middle of that market but in terms of moving that to the point where there is a commitment which will allow the auto manufacturers to take that step of putting those vehicles into production, the program will take off by itself but that first step is there, it is necessary and it will not happen again except perhaps in response to foreign competition.

Once again, in California we buy a lot of imported vehicles, more than any other State. I would rather buy American vehicles but if we start producing methanol-powered cars out of Japan, I guarantee you we will end up buying them there first and then play catch-up ball again. I wish it were different but it is not.

Let me go to my second point which is the one on priorities and here I think I may become a bit confused but nevertheless it appears to me that this administration is recommending deep cut-backs in conservation and reviewable resource programs which have the real ability to provide us with reduced consumption of oil now, not 10, 15 or 20 years from now as will be the case with the investments in fusion or breeder reactor program or whatever.

We may need those programs but we cannot tolerate the total dismantling of technologies and systems which will reduce our

dependency on oil starting right now and to me that is a confusion of priorities which the Congress should not tolerate. It is not a matter of eliminating something else, it is a matter of addressing an appropriate balance. We do need a long-term investment but we cannot eliminate essential programs now which are reducing our economic burden of shipping dollars out of this country and which in fact if we continue to operate on conservation and renewable technologies it will provide us greater national security than that same dollar invested in direct defense expenditures and I think that that is a real issue of priorities which needs to be addressed by the Congress.

Thank you very much.

Mr. LOEFFLER. Thank you.

THE NATIONAL COMMUNITY ACTION AGENCY EXECUTIVE DIRECTORS ASSOCIATION

WEATHERIZATION

WITNESS

DAVID BRADLEY REPRESENTING THE NATIONAL COMMUNITY ACTION AGENCY EXECUTIVE DIRECTORS ASSOCIATION

Mr. LOEFFLER. Mr. David Bradley representing the National Community Action Agency Executive Directors Association.

Those watching the agenda, this testimony will be in lieu of the 2:40 testimony which was to be presented by the National Energy Organizing Network, Elliott Jacobson.

Mr. Bradley, without objection, your prepared statement will appear in the record at this point.

Mr. BRADLEY. Thank you.

[Material follows:]

STATEMENT OF DAVID BRADLEY, REPRESENTING THE NATIONAL COMMUNITY ACTION AGENCY EXECUTIVE DIRECTORS ASSOCIATION, BEFORE THE INTERIOR SUBCOMMITTEE OF THE HOUSE COMMITTEE ON APPROPRIATIONS.

MR. CHAIRMAN, Ladies and Gentlemen:

My name is David Bradley, and I am here representing the National Community Action Agency Executive Directors Association. As spokesperson for the nearly one thousand Community Action Agencies accross the country which are the primary local providers of low-income weatherization assistance, I appreciate the opportunity to appear before you to support this important program and to offer suggestions for its expansion and improvement.

The need for an effective weatherization program for the poor has never been greater -- and it will continue to grow. I should like to offer for the record the latest study from the Community Services Administration: TOO COLD . . . TOO DARK: RISING ENERGY PRICES AND LOW INCOME HOUSEHOLDS. The table (31) on-page thirty of the study shows that applied to a projected mean income of \$4200 per year for households at 125% of poverty or below, if this winter is of average severity and the price of fuel oil is \$1.25 per gallon, annual home energy expenditures (exclusive of gasoline) for poor households heating with oil will represent 37 per cent of annual income. The price of home heating oil in many parts of the country has already risen above \$1.25 a gallon, and all indications are that it will continue to rise. It must also be remembered that these expenditures are concentrated in the winter months when they represent a far higher percentage of monthly income; and that these are national averages. In the colder parts of the country the picture is far worse.

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For households heating with natural gas the average percentage of annual income is 19 per cent; but with the expected de-regulation of natural gas, the situation of these households will be just as bad as those heating with oil, and there are nearly four times as many low-income households heating with natural gas as heating with oil. If the Federal Government is going to provide the safety net that will prevent the neediest of our citizens from freezing to death, it will be faced with paying fifteen to twenty billion dollars every year in fuel payment assistance . . . UNLESS a way is found to reduce significantly the home energy consumption if the poor.

This is a grim picture; but it is one faced daily by millions of poor and elderly in our nation today.

There are some ten million low income households that need weatherization. Approximately a million have been partially weatherized over the past five years through the weatherization programs carried out by the Community Services Administration and the Department of Energy. But even those dwellings have only had their energy consumption reduced through weatherization by at most twenty per cent. This is no answer when natural gas prices have risen over 100 per cent in the same period, and fuel oil prices will have risen almost as much in the last year.

What is to be done? We would like to make the following suggestions:

First, the Low-Income Weatherization program needs to be expanded.

More money must be spent on each dwelling, to achieve a reduction in

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energy consumption of at least 50 per cent. This is likely to cost an average of \$2500 per dwelling, including materials, labor, and other necessary costs, with costs in warmer areas being less, and costs in colder areas often being considerably more.

More dwellings must be weatherized each year. At the current levels of funding adequate weatherization will take more than thirty years. Even at two billion dollars a year going to weatherization it will take ten years. These are big numbers; but the amounts needed for fuel payment assistance after deregulation of gas as well as oil will be even bigger, and they will go on forever.

Second, Low-Income Weatherization needs to be tied to fuel payment assistance so that as energy consumption is reduced, assistance payments will be reduced accordingly.

Third, in order to achieve the greatest reductions in consumption and the need for assistance, Low-Income Weatherization should include greater attention to the heating source, both in terms of improving efficiency of existing sources, and in supplementing them with auxiliary heating sources such as wood stoves and low-cost, effective solar applications. Only then will we be able to help the poor to approach home energy self-reliance which will reduce significantly the need for fuel payment assistance.

Let me give one example: In Portland Maine a dwelling was optimally weatherized as a part of the CSA-funded Optimal Weatherization Research

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Project carried out jointly with the National Bureau of Standards experienced a fifty per cent reduction in heating costs as a result. Following this work, as part of a CSA-funded Wood Conversion Project, the dwelling was converted to wood heat, with the installation of a stove and the necessary improvements in the flue and chimney required for safety. This resulted in another fifty per cent reduction in heating costs, leaving the household with 25 per cent of its original costs.

Fourth, If the existing weatherization program is to continue without debilitating and disruptive interruption, at least \$100 million needs to be added to the program in Fiscal Year 1981.

Fifth, We believe that thereafter, if the kind of Low Income Comprehensive Weatherization/Conservation/Auxilliary Energy/Assistance program is to be carried out most effectively and is to reach those most in need, it should be directed by the Community Services Administration and carried out by local Community Action Agencies. This belief is based on more than five years experience in carrying out programs under the administration of both CSA and DOE.

Sixth, and finally, we urge the Congress to recognize the need for home repair as a frequent prerequisite to effective and safe weatherization. Many dwellings of the neediest are now by-passed by weatherization crews because they need extensive repairs that are beyond the resources of or prohibited under the weatherization program. Even more are, we fear, being weatherized with inadequate attention being paid to dangerously unsafe electrical wiring. In this final

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regard I should like to leave with you for the record this Report of the U.S. Consumer Product Safety Commission on Residential Electrical Wiring Systems and Thermal Insulation. It deserves attention.

I appreciate having had this opportunity to present some of the views of the nation's Community Action Agencies, who are dedicated to doing everything they can to help the poor and the elderly meet their energy needs in the most difficult times ahead.

Mr. BRADLEY. I will start off by saying I am sort of a last minute substitution here with problems up in Boston. I work with the National Community Action Agency Association which is comprised of 961 community action agencies. They are the primary deliverers of the program, so I am here today to speak to that. I appreciate this opportunity.

The need for an effective weatherization program for the poor has never been greater and it continues to grow. The latest study of the Community Services Administration just released is called *Too Cold . . . Too Dark* and in this study it highlights the problems of the poor in terms of weatherization. Some of the figures indicated in there show that if an average low income person's home is heated by heating oil they are going to spend 37 percent of their income to pay for those energy needs. The price of home heating oil in many parts of the country has already risen above \$1.25 a gallon. If the home is heated by natural gas before deregulation, we are talking about 19 percent and that is expected, of course, to almost double. If the Federal Government is going to provide any kind of safety that would prevent the neediest of our citizens from freezing to death and from having extreme financial difficulties, we are going to have to find a way to work to strengthen the weatherization program.

Mr. LOEFFLER. May I ask you a question along that line?

Mr. BRADLEY. Sure.

Mr. LOEFFLER. In the preliminary documents that we are now receiving from the administration it appears that the Energy Department's Weatherization Assistance Program will be incorporated in the Department of Housing and Urban Affairs in the CEBG program.

Mr. BRADLEY. Yes.

Mr. LOEFFLER. What is your reaction to that, at least a preliminary reaction?

Mr. BRADLEY. A preliminary reaction is we are extremely concerned that none of the funds will be designated in that block grant for weatherization. The other thing that we picked up is that they are talking about a greatly reduced funding.

Mr. LOEFFLER. In fact, are we not talking about greater efficiency if we go the route of CEBG determination being made as to whether weatherization will be expended for cause? For instance, in my district in Texas it is not as cold as it is in the Texas panhandle. Also, in the summer, it is not as hot as it is in Houston, Texas. For the States to be able to administer money in the instance of weatherization throughout the year depending on cooling or heating, can it not be done more efficiently at the State level?

Mr. BRADLEY. I respectfully disagree. I was deeply involved with the decision a couple years ago and moved from there. I truly believe that the CSA had the knowledge and the understanding of the total concept of the program and flexibility in terms of the rules and regulations and I thought that their approach when it was administered by CSA to the CAPs was an efficient way to do it and whether it be the panhandle in Texas or whatever, you didn't see the allocations coming out to CSA as you may have seen coming out of DOE.

I just returned to the Community Action about a year and half in the Carter Administration and my understanding is that the problem I have seen is that DOE has been flexible if they have not understood our program and that the CAPs have had a very difficult time in working with DOE. Our position and what we are going to work for is if there is some opportunity to shift that back into CSA if there is a CSA. We didn't have the problems with the poverty programs administered by CSA.

I wish I could go on and just ask you what your feelings are but I won't.

Mr. LOEFFLER. It is probably safe not to ask me.

Please go ahead.

Mr. BRADLEY. Probably you will be surprised by my next statement but we favor increasing the weatherization program. It makes little sense to continue to put out literally billions of potential dollars on fuel assistance payments when you can go in and weatherize the home. Currently when Community Action weatherizes the homes they are achieving a nationwide average fuel savings of about 25 percent with additional resources in just the Community Action agencies and the manpower is in place currently to do it.

In additional financial resources, we could be achieving a fuel savings of 50 percent. There are about 10 million homes that need to be weatherized and our number one concern is that the program not be lost in block grants which all of the CSA money lost on it.

Number two is that somehow weatherization loses some of its priorities possibly at the State level. We have seen that experience on poverty programs in general and on other block grant programs.

Mr. LOEFFLER. I recall during the consideration of the weatherization program that, for instance, the formula that ultimately became effective was skewed such that the Northeast was more heavily weighted than, for instance, Texas. Would this not overcome some of those problems?

Mr. BRADLEY. If you take that approach. The other approach that we take is just take another look at the formula. We are certainly willing to do it.

Mr. LOEFFLER. I would like to ask you a question. What was the policy support to the fact that CSA was removed in lieu of DOE to be the administration arm of the Executive Branch of weatherization?

Mr. BRADLEY. Well, that debate was very similar to the debate in the Carter Administration. It made sense that this was an energy program and not a poverty program.

Number two, it is sort of a laboratory. They have had a long history of spinning off successful programs such as Headstart and things like that. This should clearly be another example and not CSA coming up with some other projects along the energy lines. Very protracted debate, a lot of concern in Congress on it. I worked very much on that issue. I created a lot of concern in both the House and the Senate. One of the reasons why the debate was precluded from really a successful conclusion was that Community Services Administration went with a continuing resolution on its reauthorization bill and because of that CSA appropriations were not marked up and DOE appropriations were so we were in the

position on the Senate side to really try it over there and there was extreme concern for our position even then. It was lost in conference.

Mr. LOEFFLER. Do you believe that DOE is currently administering the Community Services Administration program in an equitable manner?

Mr. BRADLEY. No. The CAPs overall have some conditions with DOE, it still has concerns on some of the regulations, some of the flexibility, and just in getting some of the money out it takes a long time to get the money out into the State CAPs.

I got a call two hours ago and I would be happy to prepare something on what the DOE has done.

Mr. LOEFFLER. If you don't mind, submit it and it will appear in the record at this point.

[COMMITTEE NOTE.—No additional materials provided.]

Mr. BRADLEY. All right. What I want to conclude is that we think as fuel payment assistance is reduced there should be some trade-off into treating the weatherization program funding, that it makes some sense, and second of all that the weatherization program should include greater attention to the heating source. Technology has done some very interesting and exciting programs on energy that Community Action agencies are plugging into the weatherization program successfully. I would like to see that. There has been an example in the testimony and we would like to see that expanded.

Finally, last but not least, and very difficult to talk about is that if there were a proper debate about the weatherization needs, whether it be through block grants or whatever, the person needs at least \$100 million more. The capacity is there, the people are there. The needs are more than anticipated for that program. In other words, currently funded at \$200 million it could easily handle and use properly \$300 million.

That in a nutshell is our testimony.

Mr. LOEFFLER. Thank you.

MASSACHUSETTS OFFICE OF ENERGY CONSERVATION

WEATHERIZATION

WITNESS

MICHAEL SHERMAN, ASSISTANT DIRECTOR FOR WEATHERIZATION POLICY, OFFICE OF ENERGY CONSERVATION, THE MASSACHUSETTS EXECUTIVE OFFICE OF COMMUNITIES AND DEVELOPMENT

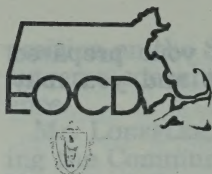
Mr. LOEFFLER. Massachusetts Office of Energy Conservation, Michael Sherman.

Mr. SHERMAN. Michael Sherman, Assistant Director for Weatherization Policy of the Massachusetts Executive Office of Communities and Development which is part of the State Executive Office of Community Development. My office runs both the DOE Weatherization Assistance Program and also administers the Fuel Systems Program under its very name in both the State and Federal.

Mr. LOEFFLER. Mr. Chairman, without objection your prepared statement will appear in the record at this point and you may proceed.

Mr. SHERMAN. Thank you.

[Material follows:]



Commonwealth of Massachusetts

Executive Office of Communities and Development

Division of Social and Economic Opportunity

10 Tremont Street Room 64 Boston, Massachusetts 02108 (617) 727-7004

Edward J. King, Governor
Byron J. Matthews, Secretary

TESTIMONY CONCERNING THE DEPARTMENT OF ENERGY WEATHERIZATION ASSISTANCE PROGRAM PRESENTED TO THE HOUSE OF REPRESENTATIVES APPROPRIATION COMMITTEE, SUBCOMMITTEE ON INTERIOR AND RELATED AGENCIES

REPRESENTATIVE MR. YATES PRESIDING, FEBRUARY 19, 1981

Thank you for the opportunity to testify today. My name is Michael Sherman. I am the Assistant Director for Weatherization Policy for the Office of Energy Conservation, the Massachusetts Executive Office of Communities and Development.

I will limit my remarks to the Weatherization Assistance Program which my office has administered since 1977 under both Community Services Administration and Department of Energy funds.

The principal questions for this committee, I believe, are whether the weatherization program is needed, whether it is an effective tool for achieving its intended purpose, and whether it should continue to be funded at the current level (\$189 million for FY'81).

Not surprisingly, perhaps, I suggest that the program is both needed and useful and, further, that the appropriation should be supplemented for FY'81 and increased for future years.

That there is a need for a conservation program specifically designed for low-income people, there is little doubt. Massachusetts is particularly dependent upon petroleum for its heating needs. Seventy percent of the low-income population in Massachusetts relies on oil as a fuel source. The average cost per gallon for heating oil has climbed from \$.99 this October to \$1.30 this week. Last heating season, a relatively mild one in the Northeast, home heating oil prices increased by approximately thirty percent. Although we have been able to assist about 140,000 households through state and federal fuel assistance programs, we have not been able to offset the tremendous increases in heating costs in any significant and permanent way for people on fixed, limited incomes. Further, with current funding we have never been able to reach more than one-half of the low-income eligible households in the state with fuel assistance. Finally, as useful as fuel assistance is to the individual who receives it, there is no benefit beyond the immediate payment. Weatherization, on the other hand, provides an immediate and more permanent solution to the high cost and usage of energy in New England.

WITNESS

MICHAEL SHERMAN, ASSISTANT DIRECTOR FOR WEATHERIZATION
POLICY, OFFICE OF ENERGY CONSERVATION, THE MASSACHUSETTS
EXECUTIVE OFFICE OF COMMUNITIES AND DEVELOPMENT

Mr. Sherman, Massachusetts Office of Energy Conservation, Michael Sherman.

Mr. Sherman, Michael Sherman, Assistant Director for Weatherization Policy of the Massachusetts Executive Office of Communities and Development which is part of the State Executive Office of Community Development. Mr. Sherman runs both the DOE Weatherization Assistance Program and also administers the Fuel Systems Program under the same name in both the State and Federal.

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We estimate that a minimal average savings in fuel use for weatherized homes is twenty-five percent to thirty-five percent, a savings which will persist for a number of years. That savings, amounting to \$400 per year at today's prices, is achieved at an average cost of \$450 in materials and an additional \$800 in labor and other program support costs. It is a substantially sound investment, returning its initial cost in three years or less and in effect "saving" disposable income for recipients' food and shelter. We have documented individual savings in the thirty-five percent to fifty percent range but do not have statistically reliable figures on the extent of this level of saving. We are in the process of obtaining that data now. Even a savings of twenty-five percent on energy costs can mean a significant change in use of limited disposable income for this population. The choices for many of the people we serve are the choices of being warm or of eating, particularly among the elderly and families with children under the age of two. There is a significant risk of hypothermia in these groups. The failure to attend to either need can be fatal, and the real choice for many elderly is too little food and too little heat.

Is the DOE Weatherization Assistance Program an effective tool for helping the people we are talking about? I believe that in the past year it has become such a tool. Massachusetts was an early and vocal critic of the DOE program mandate to use CETA labor "to the maximum extent practicable" as the shortage of available CETA labor prohibited Massachusetts from reaching its goals of weatherized homes.

The change of DOE regulations to allow for direct hiring of labor or contracting with local private and nonprofit installers has resulted in a tripling of the rate of weatherization in my state in the eight months since those changes were fully implemented. We now utilize resources of CETA workers, DOE-paid workers, and local contractors, resulting in a statewide program that is rapidly performing high quality weatherization work. That mixed work force of 300 CETA workers, approximately 60 DOE-paid workers, and a rotating pool of 120 local contractors is now weatherizing homes at an annual rate of 13,000 per year. During FY'79, the most productive prior year, we weatherized a little more than 4,000 homes and apartments. This production increase is now typical in New England and in most of the nation.

We are now faced with a different sort of problem. A 13,000 annual rate of weatherization, with an eligible population in this state of more than 250,000 households, requires an annual budget of approximately \$18 million. Massachusetts' allocation under the \$189 million FY'81 appropriation is \$5.2 million. By reallocating the remaining unspent funds from prior years, our allocation was increased to \$7.9 million, not quite six months' funds at our present rate of expenditure. I understand that there may be a little bit more in unallocated funds, but not enough to sustain program operation for a full twelve months.

We are caught in a bind. If we spread the FY'81 funds over twelve months, we will cripple the program and will have to essentially dismantle the whole effective program mechanism as labor funds will not stretch over that period. The logistics of hiring, training, and equipping weatherization crews will not allow us to scale the program down much below its present level and still maintain an effective program.

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We have chosen, with agreement from our subgrantees, to run an effective program for six months rather than continue with an ineffective program. To the best of my knowledge, all of the New England states and many other states that have geared the program up in the way that Massachusetts has are also maintaining the present, effective level of operation until the funds run out.

We in Massachusetts do not want to see the weatherization program go out of business. We are using it to save energy, to provide some protection from the continuing rise in home heating costs, to provide training of CETA enrollees, and to provide private sector contracting that would not have a market among low-income people at all without this program.

We are requesting that you consider a supplemental appropriation for FY'81 sufficient to enable Massachusetts and other states to continue operating weatherization programs at their current levels. I cannot suggest a specific amount at this time. I believe that DOE might best be able to comment on the specifics of an additional funding appropriation. We further recommend that you examine an overall increase for FY'82, so that the current high level of production can continue and energy savings can reduce our dependency on cash assistance programs.

Massachusetts recognized the need for control in federal spending. As a state we have passed our own tax limiting measure this year and are seeking to control costs carefully for the coming year. Nonetheless, weatherization is an essential anti-inflationary effort serving the sector of the population hardest hit by the continuing rise in heating costs.

I thank you for your attention and hope you will consider these remarks in your deliberations.

Respectfully submitted,

Michael Sherman
Assistant Director for Policy
Office of Energy Conservation
Massachusetts Executive Office
of Communities and Development

MS/elb

Addendum to Testimony

The previous testimony was prepared prior to the availability of the "Black Book", detailing proposed budget changes for FY'81 and FY'82. In that document, the Weatherization Assistance Program is incorporated into the HUD Community Development Block Grant program to operate "more in accord with local needs and priorities". The document states further that these two complementary programs combined are an example of "simplification" of programs. Although there is a clear relationship between weatherization and housing rehabilitation, and in fact a number of local program operators combine weatherization with existing housing rehabilitation efforts, we believe that this simplification will not result in an effective weatherization program in many communities where it is most needed.

CDBG does not operate in all communities. Not all communities that receive CDBG funds now operate a weatherization program or any similar effort. Combining this categorical program and others into the general block grant approach without either increasing funding or in some manner detailing energy related uses will result in many households that require direct energy assistance losing out. Loan programs, even at low interest for the people who cannot establish credit, or cannot pay loans back are useless to those people, as are energy conservation tax credits for investments that cannot be made on incomes that are minimally taxed.

There is a need to continue to operate an effective weatherization program now. Neither the private sector nor the proposed funding system will address the most needy. Finally and ironically, elimination of the weatherization program in Massachusetts will serve to put a number of small weatherization private sector contractors out of business. Many of these people were trained under CETA. The conservation market is still much too soft and too competitive to absorb all of these companies, even in a state as conservation conscious as is Massachusetts.

Mr. SHERMAN. I think, as many people here know, the basis of my testimony was prepared prior to seeing some of the budget recommendations from last night. I do have some response to some of them. I think I would want to briefly comment on my original intent in coming here which is to say that the weatherization program which is operating with a great deal of difficulty over the last several years at least in our State and generally in New England, and as far as I can tell in a number of other States, is operating at a fairly high level of deficiency. We are out weatherizing a lot of homes. Through the State of Massachusetts we weatherized 6,000 homes between June and the end of December of this past year.

Mr. LOEFFLER. Do you consider that number to be a large number given the magnitude of the population?

Mr. SHERMAN. Given the magnitude of the population it is not a large number. The limitations we are now running up against is that we have an effective program where we can operate 6,000 homes which was as far as the money would take us for fiscal 1980. That was a fiscal year allocation which was spent in seven months. What we are looking at now is an ability within our State to do about 13,000 homes a year. We are looking at a total of about 250,000 households for a current population estimates, where eligible, program.

Mr. LOEFFLER. What is the estimated backout of energy use as a result of weatherization that you have accomplished so far?

Mr. SHERMAN. That is a point on which information is also soft. We are being conservative, I think, estimating that we are averaging about 25 percent savings in fuel use for people where those homes are weatherized. We are doing some work now to produce a reliable study. To my knowledge no one has done that anywhere on older homes and retrofitting homes. There have been studies done on new construction and we project the studies around. They are not very hard but I think that we have seen some really serious situations.

Mr. Brady, the gentleman before me, mentioned a study talking about oil. This week in Boston the average is \$1.30. It is still climbing and what this means is that the mythical average home owner who is paying for his own heat and renters as well, and most of our renters are spending between \$1,400 to \$1,600 a year straight out of their pocket for oil heat simply for the period of October through about March and April and that is a tremendous drain on income. It is a tremendous export of personal dollars out of the region.

Seventy percent of the low income people in our State heat with oil and primarily they are doing that with old oil heating systems that were originally coal heating systems which are inefficient by their very nature. We have been able to persuade DOE to allow us a great deal more flexibility in the service and repair of heating systems and that is a top priority for us at this point. More work needs to be done in that area. We cannot, as it is sometimes more efficient, replace the heating systems. We are overall in a situation where I feel somewhat incongruous hearing the budget message last night where in order to pass our program this year we are going to need approximately another perhaps eight to nine million

dollars to operate during the year. What we will do with that money is that we will hire people.

We have gone through an extensive amount of subcontracting with small private weatherization companies primarily with the Community Action Agency. What they do in turn is the contracting. We have a fairly small, thriving industry going on for a population statement that will not be able to support it or that will not be able to be responsive to tax credits. I think in general that the Department of Energy has gotten its act largely together. There are some problems with the program and our regulations still need to be changed. There are laws that still need to be changed. Overall they are doing a fairly decent job. I think that when you look at that we have tripled the rate at which we are weatherizing homes in the State. I believe that that is a generally applicable statistic across the country at this point.

Mr. LOEFFLER. I would like to hear what your reaction is to the proposal that HUD, rather than DOE, be the agency for the CETA bloc grant effort.

Mr. SHERMAN. I think it is perhaps a little bit early to have a detailed analysis of that sort of situation.

Mr. LOEFFLER. I appreciate that.

Mr. SHERMAN. Certainly there are cases now in which the local weatherization programs are operating together and there is some sense in looking at them as part of one problem. We have a very old housing stock in New England in general. Looking at the rehabilitation is something that certainly is needed. I certainly cannot speak for the State or my Governor on this issue at all but my feeling is that what will happen in rolling weatherization in to some extent and perhaps to a large extent it will become caught up in other needs. Massachusetts has passed this year a tax on Proposition 2.5 which the intent is to essentially lower taxes in the State. He is going to be faced with a horrible budget crunch this year because the State aid to local communities at least as planned right now is going to decline tremendously.

There is going to be a good deal of backing trying to get everybody's needs taken care of in all the units of local and State government functions at least at a minimal level. So looking back and viewing the idea of the rehab program with a bit of trepidation, I think it could disappear in the process. I would say we have a State which is in general quite committed to conservation. Our Governor is committed to horticulture and a number of other things.

I think that given the realities and the fiscal problems that we are going to face in this next year or so we might well see it disappear at the time when we need it most and that disturbs me. I think it has been clear in the one shot allocations for the fuel assistance programs. Right now fuel assistance has roughly ten times the funding of weatherization nationally. That tends to be a pattern which is repeated with the fuel assistance and it is something that can satisfy people immediately, its need is urgent but there is a difficulty in looking further down the road.

I think conservationists are particularly famous for saying that any area of old housing stock with people who cannot afford to make investments are simply going to be strapped and they are

going to be struck. I am not the biggest booster, I have been very involved in trying to get them to change some of their regulations in the last couple of years. I think they have become quite responsive having started from nowhere and having started with a certain amount of hostility towards their own grantees. I think at this point we have a fairly decently functioning program. We have the delivery system that exists in the Community Action Agencies and I hope they will survive this year.

I believe that what we really need, and again this sounds incongruous in the context of last night, is to now put up more money for this program because we will not have the function of program after the summer. I think that is too bad because that is the time we do our best work.

Mr. LOEFFLER. Thank you.

FOCUS ON MICRONESIA COALITION

WITNESS

SISTER BARBARA GLENDON

Mr. LOEFFLER. In view of the fact that two of our scheduled witnesses are not here and I understand another is, we will hear now from Sr. Glendon.

Sr. Glendon, without objection, your prepared statement will appear in the record at this point.

[Material follows:]

FOCUS ON MICRONESIA COALITION

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212-870-3202

STATEMENT BY SR. BARBARA GLENDON
REPRESENTING THE FOCUS ON MICRONESIA COALITION
BEFORE THE HOUSE APPROPRIATIONS SUBCOMMITTEE
ON THE DEPARTMENT OF INTERIOR AND RELATED AGENCIES
FEBRUARY 19, 1981

Mr. Chairman:

My name is Sr. Barbara Glendon. I am the Staff Consultant for the Focus on Micronesia Coalition and am representing the Executive Board of the Coalition. We are pleased to have this opportunity to appear before your Committee. The Coalition is an ecumenical organization of US citizens and US-based organizations concerned about US policy in Micronesia. The Composition of the Executive Board reflects the membership of the Coalition and thus I would like to take a moment to give you their names. The Chairperson is Sr. Annette Mulry of the Maryknoll Sisters who have communities operating effectively in some of the district centers and in the outer islands; Reverend Edwin Luidens, Director for East Asia and the Pacific in the National Council of Churches; Dr. William Alexander, a professor of anthropology at Upsala College who has done research in Micronesia; Fr. William Wood of the New York Province of Jesuits whose schools both academic and vocational are widely respected in the islands; and the Reverend Dr. Paul Gregory of the United Church Board of World Ministries which has historical relations with the Protestant Churches of Micronesia over the past century. Both Rev. Gregory and Fr. Wood have spent time within the last six months visiting and consulting in Micronesia.

Unfortunately, prior commitments prevent these people from personally appearing here today. It is therefore my task to bring to your attention three of the Coalition's present concerns.

The first of these regards the legacy in the Marshall Islands of the US nuclear weapons testing program of the 1940's and 1950's. I do not have to remind this Committee of the history of the testing program with the consequent disruption of the lives of many Marshallese. This disruption involved not only uprooting from their homes, but unfortunately also involved exposure to radioactive fallout both internally and externally. Last year PL 96-205 was enacted mandating a "program of medical care and treatment and environmental research and monitoring for any injury, illness, or condition which may be the result directly or indirectly" of the testing program. This Appropriations Committee in its report 96-1147 urged the Department of Interior "to prepare a plan for this program as soon as possible so that it may be quickly implemented for the benefit of the Marshallese." The Committee also was open to considering "a supplemental request, if necessary, to begin the program in fiscal year 1981." The Coalition understands these remarks to be indicative

of your Committee's concern and interest for the well-being of the Micronesian people, a concern and interest which we share.

On January 14th the then Secretary of the Interior, Cecil Andrus submitted a preliminary report on the implementation of PL 96-205. PL 96-205 clearly states that the people to benefit from the law are "the people of the atolls of Bikini, Eniwetok, Rongelap, and Utirik and ... the people of such other atolls as may be found to be or to have been exposed to radiation from the nuclear weapons testing program." (Emphasis added) It is also clear from the legislative history of this law that the section I have emphasized was added so that other Marshallese, outside the four named atolls, found to have been exposed to radiation could receive assistance. However, we see nothing in the Secretary's report to indicate that there are plans to determine who the other exposed people are. The Coalition believes this to be a major omission and we seek your assistance in rectifying this situation.

There is much controversy over which Marshallese were exposed. This is recognized in Former Secretary Andrus' report in which he states "a principal dispute among the interested parties relates to the islands and atolls covered by the statute." In 1979 evidence was submitted to the United States by the Marshall Islands Government indicating that at least one other atoll, Likiep, was affected by radiation. Besides the Marshallese Government, claims by other groups, such as the Marshall Islands Atomic Litigation Project, suggest that all the Marshalls were exposed to radiation from the testing program. Attempts to document these claims relying on the records and personnel of the US Department of Energy have been frustrated. According to the Interior Department's prospectus for the Health Plan, Aug. 8, 1980, "The Department of Energy has agreed to provide a biochemical screening profile of the people of Likiep Atoll." Yet, a representative of the Marshall Islands Government reported on Dec. 17, 1980 that this had not yet been done. Similarly, access to the Northern Marshall Islands Radiation Survey of 1978 has been delayed. These frustrations and delays only further feelings of suspicion and mistrust of the Department of Energy's role. These feelings are shared by the Marshallese, members of the Coalition and other interested persons and organizations.

The Department of Energy's integrity also was questioned in the August 1980 report of the Subcommittee on Oversight and Investigation. In regard to nuclear weapons testing in the Continental US, the report concluded that "the radiation monitoring system established by the government...was deficient in giving accurate estimates of radiation exposure...; the government falsely interpreted and reported radiation rates...; the government knowingly disregarded evidence which questioned the accuracy of the government measurements of radioactivity emitted from the test site..." As a result of these findings, and also because the Subcommittee found that "a bias, or at the very least, an appearance of a bias, to promote nuclear technology...without a corresponding concern for health and safety" was operating, the Subcommittee recommended that "primary responsibility and funding authority to conduct radiation health research" not be given to the Department of Energy.

In the light of these facts and past history, the Coalition believes that in order to implement the full intent of PL 96-205, the Secretary of Interior's plan should include an independent, international, non-governmental medical and environmental survey of the Marshall Islands. We request this Committee to favor such a plan and to appropriate the necessary funds. It is our belief that controversy will continue and good US-Micronesian relations will be in jeopardy until a truly independent study is conducted. Perhaps more importantly, the Coalition believes each individual Marshallese has a right to know about his or

her own exposure or lack of exposure to radiation. Such knowledge would go a long way to relieve the personal uncertainty and anxiety and to help people deal intelligently with the long term genetic and other low-radiation effects that research has begun to surface.

The second area of concern is the still unpaid World War II Title I War Claims. It is incomprehensible to us as US citizens that more than 35 years after the end of WW II, our government has not discharged this obligation.

It is often stated that the islands were the scene of some of the fiercest fighting of the war, and clearly the local people, land and property did not escape damage from these battles. The Treaty of Peace between the United States and Japan recognized the need to deal with Micronesian war claims. It decreed that such claims would be subject to "special arrangements" between Japan and the United States. Nevertheless, the legitimate war claims of the Micronesian people were subjected to the same benign neglect as their political, economic, social and educational development during the early years of US administration of the Trust Territory. It wasn't until after the urging of the United Nations that serious negotiations on the war claims began in 1966.

An Executive Agreement between Japan and the US was reached in 1969 which discharged Japan from any further claims after a \$5 million contribution in goods and services. The US was obligated to establish a \$5 million fund to be used for the welfare of the inhabitants of the Trust Territory. The \$10 million total was decided without any Micronesian participation. This Agreement was implemented by Title I of the Micronesia Claims Act of 1971. Also, as a result of this Act, in 1972, the Micronesian Claims Commission began to investigate and adjudicate claims directly resulting from the fighting. The result of the 4 year process concluded in 1976 was the certification of claims totally more than \$34 million, \$24 million more than the amount appropriated by the US and Japan. The possibility that this total would be substantially higher was ruled out by the Oct. 20, 1980 decision of the D.C. U.S. Court of Appeals not to allow a class action suit on behalf of late claim filers.

Recognition that the US should pay 50% of the additional \$24 million is embodied in Section 105 of PL 95-134. However, our payment is made contingent upon a similar payment to be made by Japan. Since they have so far refused to make this additional contribution, the Department of the Interior has not requested an appropriation for the US share of the \$24 million. In the meantime, the 1980 United Nations Visiting Committee to the Trust Territory "noted evidence...that the failure to resolve this issue is causing inhabitants of Micronesia deep distress and indignation which is detrimental to their otherwise close and friendly relations with both parties."

The Coalition believes the United States' obligation should be honored irrespective of Japanese actions. In each of the past two years, a bill authorizing United States unilateral settlement has passed the House only to be rejected by the Senate. We regret such action by the Senate. The Coalition believes a unilateral settlement is a morally more mature stance and could be a more effective form of pressure on Japan than the present strategy of linking our actions to theirs.

As an attempt to bring this matter to a conclusion before the expiration of the Trusteeship, we urge this Committee to appropriate the US share of Title I World War II War Claims authorized by PL 95-134 to be held until the condition in PL 95-134 is met or until the preferable option of a US unilateral settlement is authorized.

In this connection, the Department of the Interior has not requested an appropriation for the United States share. In the meantime the United Nations Visiting Committee in 1980 noted that the failure to resolve this issue is causing the inhabitants of Micronesia a deep concern and indignation which is detrimental to their otherwise close and friendly relations with both the United States and Japan.

The Coalition believes that a unilateral settlement is a morally more mature stance than linking the fulfillment of our obligation to the actions of the Japanese. A unilateral settlement may also prove to be a more effective form of pressure on the Japanese than our present strategy; however, bills passed by the House authorizing such a settlement have not gained support in the Senate. In

The third and final area of concern is related to the Compact of Free Association. The Compact, in its latest form was initialed in October and November, 1980, by representatives of all three Micronesian entities: the Marshall Islands, the Federated States of Micronesia (FSM), and Palau. In addition some of the accompanying subsidiary agreements were initialed by the Palau and FSM representatives. These included the military land use and operating rights agreement, the radioactive and other harmful substances agreement, and the law of the sea considerations. The other subsidiary agreements have yet to be finalized. The Coalition is presently studying the Compact and the subsidiary agreements. As we have progressed with our study, we also tried to ascertain if similar study was being undertaken by the people of Micronesia, those who would be most directly affected by the Compact. We are concerned about what we have discovered.

The May 1980 United Nations Visiting Committee noted that "even sophisticated Micronesians were for the most part woefully ignorant about the steps leading to termination of the Trusteeship Agreement, and appeared to be equally ill-informed about the political options open to them, including the terms of the draft compact of free association being negotiated by their leaders with the United States Government." Then, in January of this year our local contacts in Micronesia informed us the Compact is just now being translated into the native languages and that "at present it is very difficult even to obtain an English copy!" (Emphasis in the original) For some, there was little doubt that an educational process would be forthcoming, but a certain degree of scepticism as to its effectiveness was manifested. "Probably it will tend to 'sell' the Compact." For others, particularly in the outer islands, the very existence of a program was doubted. "It is so sad that there will be another plebiscite by an uninformed people."

Responsibility for political education in Micronesia was given to the Education for Self-Government Program which was funded by Congressional Appropriations. In the past, this Program concentrated on the immediate political task of preparing the people for the plebiscites on the various constitutions. In 1979, with constitutional governments in place in all but one of the Micronesian entities, the Program was officially terminated. It was felt that the local governments should assume the major responsibility for further political education. However, money was included in the Department of the Interior's budget request for the Trust Territory for funding materials which would "encourage the development of the average citizens potential to contribute meaningful (sic) to the dialogue on the future political status of Micronesia."

When we asked our local contact people if there was any way the Coalition could be helpful in regard to the pre-plebiscite educational process, the answer was "Pressure ... for an educational process." In response to this request we have written to the High Commissioner of the Trust Territory requesting information on the political education program. We respectfully urge this Committee also to make such inquiries. We have been informed that a plebiscite on the Compact could take place as early as this summer in which case some prodding may be necessary to get the education programs underway in a timely fashion. We feel that since US Department of Interior monies were appropriated for this purpose, an inquiry from your committee would be in order.

We trust that you will consider seriously our concerns and requests, and we look forward to hearing from you regarding the decisions you make in these matters. Thank you again for the opportunity to appear before you today. If I can clarify any of these items, I would be happy to answer questions.

Mr. LOEFFLER. You may proceed.

Sr. GLENDON. Thank you, Mr. Chairman.

I represent the Focus on Micronesia Coalition which is an ecumenical group of U.S. citizens and U.S. church-based organizations that are interested in U.S. policy in Micronesia, a Trust Territory of the Pacific. They have three concerns that I would like to bring before you today.

Our first concern regards the legacy in the Marshall Islands with the U.S. nuclear weapons testing program that took place in the 1940's and 1950's. Last year Public Law 96-205 was enacted mandating a program of medical care and treatment and environmental research and monitoring for any injury, illness, or condition which may be the result directly or indirectly of the testing program. The bill stated that the people of such other atolls as may be found to be or to have been exposed to radiation from the nuclear weapons testing program would benefit from this program as well. I emphasize here the people of such other atolls as may be found to be or to have been exposed to radiation from the testing program.

We believe that in justice to the Marshallese and so the full intent of the law could be implemented a plan to determine the nature and the extent of the exposed population and land area is necessary. Also, because of past history of delays and frustrations associated with the Marshallese request for information and services from the Department of Energy, and in light of the recent criticism of the Department of Energy by the Subcommittee on Oversight and Investigation, the Coalition feels this plan should be independent of the Department of Energy.

When the Secretary of the Interior presented his preliminary report on the plan to implement in January of this year we did not see anything in the report that addressed our concerns. We believe that there should be a plan that would include an independent, international, nongovernmental medical, and environmental survey of the Marshall Islands and we would request that this committee favor such a plan and appropriate the necessary funds.

Our second concern is the still unpaid World War II Title I war claims of the Micronesians. It is incomprehensible to us that U.S. citizens more than 35 years after the end of World War II, our Government has not discharged that obligation. Recognition that the United States should pay 50 percent of the \$24 million unpaid certified claims is embodied in Section 105 of Public Law 95-134. However, our payment is made contingent on a similar payment to be made by the Japanese. Since Japan has so far refused to make this contribution, the Department of the Interior has not requested an appropriation for the United States share. In the meantime the United Nations Visiting Committee in 1980 noted that the failure to resolve this issue is causing the inhabitants of Micronesia a deep concern and indignation which is detrimental to their otherwise close and friendly relations with both the United States and Japan.

The Coalition believes that a unilateral settlement is a morally more mature stance than linking the fulfillment of our obligation to the actions of the Japanese. A unilateral settlement may also prove to be a more effective form of pressure on the Japanese than our present strategy; however, bills passed by the House authorizing such a settlement have not gained support in the Senate. In

an attempt to bring this matter to a conclusion before the expiration of the trusteeship and under existing U.S. law we would urge this committee to appropriate the U.S. share of Title I World War II claims authorized by Public Law 95-134. Then these funds could be held until the condition was met or until preferable the action of the U.S. unilateral settlement is authorized.

The third and final area of concern is related to the Compact of Free Association. The Coalition is presently studying the Compact and the subsidiary agreements which were initiated in October and November. We also tried to ascertain if a similar study was being undertaken by the people of Micronesia, those who would be most directly affected by the Compact. We are concerned about what we have discovered.

The United Nations Visiting Committee stated that even sophisticated Micronesians were woefully ignorant about the draft compact of free association being negotiated by their leaders with the United States Government. In January of this year our local Micronesian contacts informed us that the Compact is just now being translated into the native languages and at present it is very difficult even to obtain an English copy. For some there was little doubt that an educational process would be forthcoming, but a certain degree of skepticism as to its effectiveness was manifested. Probably it will tend to "sell" the Compact. For others, particularly in the outer islands, the very existence of a program was doubted. It is so sad that there will be another plebiscite by an uninformed people.

In 1979, with constitutional governments in place in all but one of the Micronesian entities, the program was officially terminated. It was felt that the local governments should assume the major responsibility for further political education. Money was included the Department of the Interior's fiscal year 1981 budget request for the Trust Territory to fund materials which would encourage the development of the average citizen to contribute meaningfully to the dialogue on the future political status of Micronesia.

When we asked our local contact people if there was any way the Coalition could be helpful in regard to the pre-plebiscite educational process, the answer was "Pressure . . . for an educational process." In response to this request we have written to the High Commissioner of the Trust Territory requesting information on the political education program. We respectfully urge this Committee also to make such inquiries as to the disposition of those monies that were allocated.

We trust that you will consider seriously our concerns and requests. We thank you for this opportunity to appear before you today. If you have any questions, I would be happy to try to answer them.

Mr. LOEFFLER. I have no questions. I thank you for appearing before the committee. We will review your testimony very carefully.

Sr. GLENDON. I am looking forward to hearing from you.

Mr. LOEFFLER. Thank you.

AMERICAN GAS ASSOCIATION

FOSSIL PROGRAMS

WITNESSES

GEORGE H. LAWRENCE, PRESIDENT, THE AMERICAN GAS ASSOCIATION
LATIMER (LAD) P. LORENZ, MANAGER, TECHNOLOGY DEVELOPMENT-
GOVERNMENT RELATIONS, AMERICAN GAS ASSOCIATION
MIKE GERMAN, TECHNICAL STAFF

Mr. LOEFFLER. American Gas Association, Mr. Lawrence.

Without objection, your prepared statement will appear in the record at this point.

[Material follows:]

STATEMENT OF
 GEORGE H. LAWRENCE, PRESIDENT
 THE AMERICAN GAS ASSOCIATION
 BEFORE THE
 INTERIOR SUBCOMMITTEE
 OF THE COMMITTEE ON
 APPROPRIATIONS
 U.S. HOUSE OF REPRESENTATIVES
 ON THE FY 1982 ENERGY R&D BUDGET

February 19, 1981

Introduction

Mr. Chairman and Members of the Subcommittee:

On behalf of the American Gas Association, which represents nearly 300 natural gas distribution and transmission companies serving over 160 million U.S. consumers in all 50 states, I am pleased to provide you with our industry's views on the FY 1982 energy research and development budget.

Natural gas currently provides about 27% of U.S. energy supplies. Gas is used in about 55% of all residential and commercial establishments in the U.S., and provides about 40% of the energy consumed by U.S. industry. More gas is produced domestically than any other fuel, and gas provides two and one-half times as much end use energy to consumers as electricity.

The member companies of the A.G.A. have a vital interest in the research and development programs of the Department of Energy (DOE) aimed at developing processes and resources which will increase natural gas supplies, as well as those programs aimed at developing processes and equipment to conserve natural gas. The reliance of the United States on insecure sources of foreign oil continue to increase the vulnerability of our nation, and particularly U.S. industrial customers, to energy short-falls. Because natural gas is interchangeable with oil in most stationary applications, the use of natural gas in such applications can represent a potential savings to the United States of nearly 5.5 million barrels a day of imported oil by 1990. The A.G.A. firmly believes the gas related programs of the DOE will make an essential contribution to developing new sources of gas supply and new methods to conserve natural gas in order to reduce our dependence on imported oil.

The development of synthetic fuels and particularly coal gasification hold great promise for this nation and the gas industry. We support the recent OMB statement that the federal government's role should be "to support a limited number (5-8) of first-of-a-kind operating plants to demonstrate technical, economic and environmental problems and costs, to rely primarily on the private sector and to minimize the net expenditures of Federal funds." There is no project in the U.S. which fits this rationale better than the Great Plains High-Btu Coal Gasification Project. Let

me to make such inquiries as to the disposition of those monies that were allocated.

We trust that you will consider seriously our concerns and requests. We thank you for this opportunity to appear before you today. If you have any questions, I would be happy to try to answer them.

Mr. Loeferer: I have no questions. I thank you for appearing before the committee. We will review your testimony very carefully.

Mr. Gribben: I am looking forward to hearing from you.

me emphasize that all that is required is for the DOE, under the new administration, to honor the conditional commitment that was given to the Great Plains project sponsors late last year. The recent statement by Secretary Edwards indicating support for the project and the loan guarantee is encouraging. A.G.A. would request that the Subcommittee urge DOE to provide the loan guarantee to the Great Plains project expeditiously so as to allow construction this spring. If the conditional loan guarantee granted Great Plains by DOE is finalized, it would not involve any federal budget outlays for FY81 or FY82.

In addition to such first-of-a-kind commercial scale plants, A.G.A. strongly supports the coal gasification demonstration plant program which will result in improved coal gasification and indirect liquefaction processes. I am speaking in particular about the 2nd generation High-Btu coal gasification plants of the Illinois Coal Gasification Group, Conoco Inc. and the medium-Btu coal gasification project of Memphis Light, Gas and Water. Budget options presently under consideration by the Administration appear ready to sacrifice the demonstration plant aspects of synthetic fuels technology development in an effort to control federal spending. While this goal is laudable, it would not be cost effective to neglect any phase in the development of a synthetic fuels industry.

These three proposed plants are the culmination of a comprehensive technology development and evaluation program involving several gasification processes. Starting from the assessment of bench scale processes through about seven pilot plant tests, these three processes have been selected for demonstration. No other technology development effort has undergone such an extensive evaluation. Based on the merits of these projects, combined with the contribution their technology development will make to synthetic fuel production, these three projects should be allowed to proceed.

We recognize that the budget impact of technology demonstration is substantial, but if federal involvement in such demonstrations is to be limited, we would suggest that such limits be universally applied to all programs including nuclear programs. We are convinced that if the benefits and costs of the coal gasification demonstration projects were weighed against benefits and costs of other DOE demonstration projects, there would be more emphasis placed on coal gasification than is currently the case.

We are also very concerned about OMB budget documents suggesting cutbacks in enhanced gas recovery R&D programs. The apparent rationale is that the decontrol of gas prices in this category will reduce the need for R&D. The fact is that most of the unconventional gas resource base cannot be produced with current technology. Only an aggressive DOE program aimed at advanced gas recovery technology in the area of improved fracturing techniques, well stimulation and propping agents will convert this resource base into a gas supply. The gas resource base in western tight sands, eastern Devonian shales, coal bed methane and other unconventional geologic reservoirs requiring R&D is so large that government support is absolutely justified. Advance technology in unconventional gas recovery could result in 9 Tcf per year of gas

production by the year 2000 compared to less than half that amount with existing technology. R&D in this area definitely meets the "high-risk, high-payoff" criteria associated with DOE Fossil Energy Programs.

Another area of interest to the gas industry is the development and utilization of our vast peat resource. Even excluding permafrost areas, peat resources are about 120 billion tons with a potential energy content of nearly 1,500 quads. This largely ignored resource has the potential to grant a degree of self-sufficiency to otherwise energy-poor regions and to significantly supplement the energy supply of the United States. With such a high pay-off possible, it is inappropriate to limit R&D activity in peat harvesting, dewatering and gasification.

Finally, Mr. Chairman, I would add that last year Congress passed P.L. 96-512, the Methane Transportation Research Development and Demonstration Act of 1980. This act provides for a \$3 million authorization in FY82 for methane vehicle RD&D programs. More than any other option, natural gas has the potential to reduce the transportation sector's dependence on liquid fuels, with positive environmental benefits. While the \$3 million could be put to good use, in light of the current budget constraints, we strongly recommend that at least \$1 million of the DOE's Office of Transportation funds be appropriated in FY 1982 to carry out the provisions in this Act.

Overall, we respectfully recommend the following positions to the Subcommittee:

- 1) DOE should be encouraged to provide a loan guarantee to the Great Plains project expeditiously to allow construction this spring.
- 2) The Subcommittee should encourage DOE to evaluate all technical demonstration projects (including nuclear projects) on their merits and potential supply contributions and fund those projects that will provide future substantial benefits to our nation's energy requirements.
- 3) The Subcommittee should recommend the ICGG and Conoco high-Btu demonstration plants be funded in FY82 at levels sufficient to allow both projects to go forward. The Memphis Industrial Fuel Gas Demonstration Project should be funded at \$142.8 million in FY 1982.
- 4) The Subcommittee should recommend that DOE continue aggressive R&D efforts in the enhanced gas recovery program.
- 5) The Subcommittee should recommend funding the IGT Peat Gasification project.
- 6) The Subcommittee should recommend funding the Methane Vehicles RD&D projects at at least \$1 million for FY 1982.

Last December, the United States Department of Energy announced the selection of 79 synthetic fuels proposals for feasibility study and cooperative agreement awards totalling \$270 million. The projects selected were from among the 1085 proposals submitted to DOE. The appropriation for these awards was part of P.L. 96-304, the FY 1980 Supplemental Appropriations. OMB budget documents indicate the Administration will seek a rescission of these FY 1980 funds. We believe the DOE award announcements should be honored. This program will provide invaluable seed money for a number of key synthetic fuels projects and has been relied upon by private sector project sponsors in their planning. If this program must be cut back, we recommend that DOE should finalize awards to those projects with 30% or more private sector financing. Such a criteria will weed out poorer projects and could reduce overall program costs from \$300 million to \$100 million or less.

Thank you for the opportunity to testify. I will be pleased to answer any questions you may have.

Mr. LAWRENCE. May I compliment the committee on processing so expeditiously with your list of witnesses.

I am George Lawrence, President of The American Gas Association. I am accompanied by Mr. Latimer Lorenz, Manager of our Technology Development and Government Relations, and Mr. Mike German of our Technical Staff.

I will try to summarize this rather quickly, Mr. Loeffler. We have about five basic points that we want to cover.

Number one, which is not actually a part of the fiscal year 1982 budget but is the loan guarantee that is pending on our Great Plains, that coal gasification plant that I think most of the members of your committee are familiar with. We hear some very encouraging signs from the administration, including the Department of OMB and DOE, that they will go ahead and honor their own guarantee. We think that is great because this is a vital project and it will involve no cash outlays. We think this loan guarantee will never be triggered but as an opening point we would certainly urge the committee to urge support and expeditious handling of that loan guarantee.

Our basic concerns kind of fall around one basic point. We seem to hear an echo here when we get to budget cutting. It always seems to be the gas-related R&D that gets the lion's share of the prudence. Already the gas-related R&D of the total research budget is some eight or nine percent compared to 77 or 78 percent that is electric and nuclear oriented. Here again we see that there is a tendency to preserve the nuclear research and cut the gas research. We think that the contribution that the gas energy can make and the gas-related R&D can make is much more significant certainly in the transition period of the next 20 to 30 years and we think these cuts at this time ought to be relooked at.

The principal points that we would like you to focus on, there are three coal gasification demonstration plants that are a part of the fiscal 1982 budget. These projects are the Illinois Coal Gasification Group, Conoco, Inc., and the Memphis Project and I think you have heard from representatives of each of those today. These are all projects that have undergone a lot of competition. They went through the weeding out process of the seventh year pilot plant testing program and we think in all cases they are being funded in a range of 50 percent by the project venturers. The previous budget had something in the range of \$55 million devoted to this and we think that should be preserved.

That is the way to get second generation improved technology in the coal gasification process on steam in the most expeditious way. We have all this coal in the United States, we keep talking about how are we going to use it most efficiently in the most compatible way. You can make a very good case of coal gasification to meet those tests.

Another project that has been cut rather sharply is the enhanced gas recovery and here again the type formations of the Rocky Mountain area, the shale, the Appalachian area, where there was something like I think \$300 million the previous administration recommended for the fiscal year 1982 budget and that has been cut to something in the range of \$10 million. The potential here is

huge. We are talking about 1,200 trillion cubic feet of gas in these areas.

The administration's point in their budget prudence is that they proposed deregulation of new gas prices which will take care of that and certainly AGA has been very supportive of new gas regulation for many years but we think also a lot of this is technologically sensitive as well as price sensitive. We do need to evaluate some of these enhanced recovery projects so I think that is an area where there is vast potential. In fact, we can probably get the most energy per dollar of R&D investment than anything we can think of.

Another area of modest allocation in the previous budget was in the range of \$9 million for our peat gasification and a couple of things I think are mentioning here. Peat also would make a major long-term synthetic fuel contribution. Peat is located in many places, it is not just in the typical coal producing geographical areas. Peat is in most of our fifty States, many of which are normally considered to be the consuming State areas.

I think perhaps an overriding point is the one which Mr. Bernard Lee of IGT alluded to earlier in the testimony and that is that this research would be conducted at the IGT pilot plant project part of the seventh year funded by AGA and the Federal Government jointly. It is a means of utilizing that plant which would otherwise be mothballed. I think Mr. Lee recommended that at least \$5 million of the original \$11 million is essential to preserving that ongoing program and we would certainly support that.

A point that was the subject of approval in the last Congress, Mr. Loeffler, that you are very familiar with was the methane fuel vehicle research. This is something that we could not get DOE's attention on. They had the electric car but we could not get them interested in the methane. The Glickman bill did pass both houses of Congress and was signed into law and provided \$3 million in 1982 for methane research. We are sympathetic to the budget cutting but we think something in the range of a million dollars at least should be focused on this because it can make, I think, some major contributions in fleet vehicle use for substitutes for gasoline and it gets to be pursued.

A final point is last December the Department of Energy announced the selection of some 79 synthetic fuel projects to be funded by about \$270 million and these were competitive winners out of over a thousand proposals and the appropriation for these awards was part of Public Law 96-304 and the fiscal year 1980 supplemental appropriations. The present thought is to rescind any outlays for this. We believe these awards should be honored. We think a lot of the private sector has entered into these competitive projects. They devoted their own venture capital to pursuing them and at the very least if there is going to be a real cutback in these areas we hope at least we would focus on those areas that had some significance, say 30 percent funding by the private sector, that those projects should certainly get a second look and be considered for continued funding in the fiscal year 1982.

That would conclude my sermon, Mr. Loeffler, and I appreciate the chance to respond to any questions.

Mr. LOEFFLER. I have no questions except perhaps just to follow on. The \$270 million had been selected in your final comments and you would use 30 percent funding from the private sector. What would that leave the number at approximately?

Mr. LAWRENCE. I think that would probably cut the funding down to \$100 million or less, the projects that do have that similar proposal of equity funding, so it would cut it a third. That would be consistent with their budget trend and the lean and hungry look but at the same time it would not just throw out several years of competitive awards programs that the DOE had been engaged in and the private sector responded to.

Mr. LOEFFLER. Do any of you gentlemen have any other comments to add?

Mr. GERMAN. On that time program there are sites that have been procured by private firms. Expenditures have been made so there has been a commitment after the awards by private firms to move forward with the program and it would seem somewhat unfair after this commitment has already been made to just now pull back from announced awards and cancel out the program. There has been some significant private sector that was made on the basis of the announced awards to date.

Mr. LOEFFLER. Can you give the subcommittee those numbers?

Mr. GERMAN. We spoke to people from Consolidated Natural Gas and Northern Natural Gas this morning and both of those firms are in the process of procuring sites and water. We talked to Janes and they had put together private sponsors. An additional \$100,000 just to put forward, you have to hire consultants to make a proposal. We could come forward with that for the record and detail how much has been expended.

Mr. LOEFFLER. I would appreciate that information included in the record at this point.

[COMMITTEE NOTE.—No additional materials provided.]

Mr. LORENZ. The only other comment, there has been some talk of transferring the program. I think we could support such a transfer if the entire synthetic fuels demonstration program was to be transferred and not have selected movement. If the entire program in the total was transferred and then those projects would be evaluated based on their merits by the corporation, we think that the programs fair well in that kind of analysis and could support that kind of transfer. There are certain things that would need to be done to the legislation that establish this Synthetic Fuels Corporation to allow them to do demonstration projects. We could outline what kind of changes will be necessary in order to facilitate that kind of transfer but only if the entire synthetic is going to be transferred to the corporation could we support such.

Mr. LAWRENCE. We are not sure we see that, Mr. Chairman.

CITIZENS COAL PROJECT OF THE ENVIRONMENTAL POLICY INSTITUTE

WITNESS

EDWARD GRANDIS, DIRECTOR, CITIZENS COAL PROJECT, ENVIRONMENTAL POLICY INSTITUTE

Mr. LOEFFLER. Citizens Coal Project of the Environmental Policy Institute, Mr. Grandis.

Mr. Grandis, without objection, your formal statement will appear in the record at this point.

[Material follows:]

ORAL STATEMENT

OF

EDWARD GRANDIS, DIRECTOR

CITIZENS COAL PROJECT

ENVIRONMENTAL POLICY INSTITUTE

Chairman Yates and Members of the Subcommittee on Interior, thank you for this opportunity to testify regarding the FY-82 budget for the Office of Surface Mining. I am Ed Grandis, Director of the the Environmental Policy Institute's Citizens Coal Project. The Environmental Policy Institute is an independent non-profit research and educational organization specializing in analytical work and distribution of information relating to the environmental, economic, and social impacts of energy resource production and utilization, water resource and land use management policies. Through the Citizens Coal Project, the Institute is closely monitoring the implementation of Public Law 95-87, the Surface Mining Control and Reclamation Act of 1977.

As it has often been stated, the Strip Mining Act was conceived in controversy. Its infancy, the interim program, has been critically watched and challenged by the states, industry, and residents of the nation's coal regions. Overall, we would rate the performance of the Office of Surface Mining (OSM) as good. While deadlines have been missed and extended, the agency is essentially on track with achieving the goals of the Act.

I come before this committee today to raise a matter of critical concern. A decade of work has gone into developing and implementing the Strip Mining Act. We are desperately concerned that all these years of effort do not disappear within the first year of state primacy. Only a viable federal presence through oversight with adequate inspection activities will ensure state and industry compliance, however the coal industry and certain states are today taking advantage of this period of uncertainty due to a new administration to further erode the credibility of the surface mining program. Interior Secretary James Watt has followed the advice of the Heritage Foundation to "make an example of OSM." Acting Director Andy Bailey, upon the mandate from Secretary Watt, has instructed the entire agency to flush out all regulations that are "excessive, burdensome, or counterproductive to coal mining operations."

CITIZENS COAL PROJECT OF THE ENVIRONMENTAL
POLICY INSTITUTE

WITNESS

EDWARD GRANDIS, DIRECTOR, CITIZENS COAL PROJECT, ENVIRONMENTAL POLICY INSTITUTE

These policy decisions are having a tremendous impact in the states. Since I last testified in March of 1980, 16 states have received primacy. Eight states have been enjoined from resubmitting their program for approval. All but one of these suits occurred after the November presidential election. Since the confirmation of James Watt as Interior Secretary there has been a further erosion of the state primacy process.

Several states that are still in the interim phase have indicated that they are either rethinking whether or not they actually want primacy or they are weakening their enabling statute to reflect pre-1977 positions. One state that recently achieved primacy has had that agreement voided by a resolution in its state legislature. As Secretary Watt dismantles the federal regulations, we will see states with primacy modify their programs. Many states in adopting federal legislation added the provision that their program could be no more stringent than the federal program. If federal regulations are in fact weakened, the result might be states with programs even weaker than those they had prior to the federal law.

I bring these concerns to the committee for they will have an impact on the role that OSM will have in oversight. While it is fair to assume that all twenty-four states will obtain primacy this year, the quality of these programs and their implementation will not be known for several years. We do not challenge either the proposed Carter or Reagan analysis that the principal inspection and enforcement activity of OSM will be oversight. We are concerned that the compromised I & E budget proposed by Carter will be drastically reduced to an unrealistic level by Reagan. It is our understanding that up to one third of the proposed I & E budget has been slashed resulting in the drip in the number of inspectors from approximately 100 to approximately 70 nationwide. Their job will be to monitor the ability of the states to adequately inspect and exercise enforcement actions over approximately 15,000 inspectable mining units and to respond to citizen requests for assistance.

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We are concerned, however, that the compromised I&E budget proposed by Carter will be drastically reduced to an unrealistic level by the new Reagan Administration. It is our understanding

We question the adequacy of both Carter and Reagan proposals. While we support in principle the state primacy concept, recent events prove to us that the congressional mandates in the act will not be realized without a strong and aggressive oversight program. During the interim program a number of gross abuses have continued. Spoil is still being dumped over the downslope in steep slope areas of Appalachia. Prime farmland soils are being mined and allowed to return to less than pre-mining productivity. Proof of reclamation still has not been established in the semi-arid regions of the West. Irresponsible blasting and illegal mining activities are still occurring in parts of the country.

We recommend that this committee thoroughly investigate the status of state programs including their inspection and enforcement records. Additionally this committee should concern itself with the mode of oversight the agency intends to do. Is statistical sampling a fair and accurate way to determine state and industry compliance when the method of coal mining, type and size of operation, geology and climate are so diverse? What will the impact of modified and possibly vague regulations be on the oversight capability of the agency to meet its statutory requirements? We urge this committee to scrutinize this budget and ensure the mandates of Congress that public safety and environmental protection are met.

We respectfully request that this subcommittee ask the Office of Surface Mining to provide written documentation that will answer the following questions:

1. Is the proposed program for oversight designed to address the anticipated problems regarding a state's compliance?
2. Does the proposed oversight program factor in the various mining methods, including the distances between mines, and other special circumstances such as wildcat mining, steep slope mining, mountain top removal, prime farmland, and alluvial valley floors?
3. What financial and human resources would be required to carry out one complete inspection per year as part of its oversight responsibilities?

Thank you for the opportunity to address you today.

Mr. GRANDIS. Thank you, Congressman Loeffler.

I would like to thank you for this opportunity to testify regarding the fiscal year 1982 budget for the Citizens Coal Project Environmental Policy Institute. Our institute has been monitoring the implementation of Public Law 95-87, the Surface Mining Control and Reclamation Act of 1977, with citizens' groups and agriculture organizations and State officials throughout the country in this process.

As it has often been stated, the Strip Mining Act was conceived in controversy. Its infancy, the interim program, has been critically watched and challenged by the States, industry and residents of the Nation's coal regions. Overall, we would rate the performance of the Office of Surface Mining as good. While deadlines have been missed and extended, the agency is essentially on track with achieving the goals of the Act.

Only a viable Federal presence through oversight with adequate inspection activities will ensure State and industry compliance; however, the coal industry and certain States are today taking advantage of this period of uncertainty due to a new administration to further erode the credibility of the surface mining program. Interior Secretary James Watt has followed the advice of the Heritage Foundation to make an example of OMS. Acting Director Andy Bailey, upon the mandate from Secretary Watt, has instructed the entire agency to flush out all regulations that are excessive, burdensome, or counterproductive to coal mining operations.

These policy decisions are having a tremendous impact in the States. Since I last testified in March of 1980, 16 States have received primacy. Eight States have been enjoined from resubmitting their program approval. All but one of these suits occurred after the November presidential election. Since the confirmation of James Watt as Interior Secretary there has been a further erosion of the State primacy process.

Several States that are still in the interim phase have indicated that they are either rethinking whether or not they actually want primacy or they are weakening their enabling statute to reflect pre-1977 positions. One State that recently achieved primacy has had that agreement voided by a resolution in its State legislature. As Secretary Watt dismantles the Federal regulations, we will see States with primacy modify their programs. Many States in adopting Federal legislation added the provision that their program could be no more stringent than the Federal program. Therefore, if Federal regulations are in fact weakened, the result might be States with programs even weaker than those they had prior to the Federal law.

I bring these concerns to the committee for they will have an impact on the role that OSM will have in oversight. While it is fair to assume that all twenty-four States will obtain primacy this year, the quality of these programs and their implementation will not be known for several years. We do not challenge either the proposed Carter or Reagan analysis that the principal inspection and enforcement activity of OSM will be oversight.

We are concerned, however, that the compromised I&E budget proposed by Carter will be drastically reduced to an unrealistic level by the new Reagan Administration. It is our understanding

that up to one-third of the proposed I&E budget has been slashed resulting in the drop in the number of inspectors from approximately 100 to approximately 70 nationwide. Their job will be to monitor the ability of the States to adequately inspect and exercise enforcement actions over approximately 15,000 inspectable mining units throughout the country and to respond to citizen requests for assistance.

We question the adequacy of both the Carter and Reagan proposals. While we support in principle the State primacy concept, recent events prove to us that the congressional mandates in the act will not be realized without a strong and aggressive oversight program. During the interim program a number of gross abuses have continued. Spoil is still being dumped over the downslope in steep slope areas of Appalachia. This is called excessive flooding.

Prime farmland soils are being mined and allowed to return to less than pre-mining productivity. This is having an impact to meet proper crop yields. Proof of reclamation still has not been established in the semi-arid regions of the West. Irresponsible blasting and illegal mining activities are still occurring in parts of the country.

We recommend that this committee thoroughly investigate the status of State programs, including their inspection and enforcement records. Additionally this committee should concern itself with the mode of oversight the agency intends to do. Is statistical sampling a fair and accurate way to determine State and industry compliance when the method of coal mining, type and size of operation, geology and climate are so diverse? What will the impact of modified and possibly vague regulations be on the oversight capability of the agency to meet its statutory requirements? We urge this committee to scrutinize this budget and ensure the mandates of Congress that public safety and environmental protection are met.

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3. What financial and human resources would be required to carry out one complete inspection per year as part of its oversight responsibilities?

Before I sum up I would like to add a comment which I do not have in writing regarding the BLM budget for I understand that is being reviewed today also. Is that correct?

Mr. LOEFFLER. Before this subcommittee?

Next week.

Mr. GRANDIS. I will defer those comments until next week.

I would like to thank you for the opportunity to address the committee today.

Mr. LOEFFLER. If you would provide for the record data which supports some of the general statements you have made with respect to the various users, we would appreciate that.

Mr. GRANDIS. Thank you very much.

[COMMITTEE NOTE.—No additional materials provided.]

Mr. GRANDIS. May I ask the committee what type of time frame we are looking at?

Mr. LOEFFLER. We will keep the record open for several weeks. You will have plenty of time.

Mr. GRANDIS. Thank you.

The questions that I have raised, would they be considered forwarded to the agency for their response?

Mr. LOEFFLER. Yes.

Mr. GRANDIS. Thank you very much.

Mr. LOEFFLER. As we conclude our work today the record will remain open for several weeks for additional statements to be submitted by those who could not be in attendance today.

We have a statement from the Duluth Community Action Program presented by Susan Askelin. A written testimony submitted to us from Tobias Anthony on behalf of the Bi-Phase concentrator, subsidiary of Research Cottrell may be made part of the record.

The COGAS Development Company has sent a statement that may be made part of the record. There is a statement from Donald Dahlstrom, Chairman of the Advisory Committee on Mining and Mineral Resources and Research, and Vice President and Director of Research and Development for the Envirotech Corporation. Also, the statement from Elburt Osborn, Vice President for Research Emeritus, the Pennsylvania State University will be made part of the record. The written testimonies on the Magnetohydrodynamics (MHD) program from the Mountain States Energy, Inc. and the Montana Power Company may be made part of the record.

The document from Lyle Sendleem, Chairman of the Association of Mineral Institute Directors will be made part of the record. The written testimony sent by James Robison on behalf of Southern Indiana Shale Oil Co., Inc. will be made part of the record as well.

Before I adjourn I would like the record also to reflect my great appreciation to the distinguished Chairman of the subcommittee, Mr. Yates, who had official responsibilities to take care of in the Chicago area and he asked me to sit in and to chair the subcommittee hearing in his absence today. It has been a pleasure and I have enjoyed working with counsel as well.

If there is no other business to come before the committee, we will be adjourned until Tuesday, February 24, at 10:00 a.m.

[The statements follow:]



CITY
OF
DULUTH

Duluth Community Action Weatherization Program
1305 London Road
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(218) 723-3796

Duluth Community Action Program
206 West Fourth Street • Duluth, Minnesota 55806
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February 16, 1981

House Sub Committee on Interior Appropriations
B308 Rayburn House Office Building
Washington, D.C. 20515

To: The Honorable Sidney R. Yates & Committee Members
From: Susan Askelin
Duluth Community Action Program
Re: Weatherization Assistance Program for Low Income Families
Public Hearing, February 19, 1981

I have been coordinating Duluth's Weatherization Program for two years, and am seriously concerned about the proposed elimination of federal conservation programs in general, and the Weatherization Program in particular.

In May of 1980, we were instructed by the Department of Energy and the State Department of Economic Security to massively increase production in order to expedite completion of the large number of homes left to weatherize, and to deplete the unspent funds appropriated in previous years for Weatherization. Accordingly, an additional 20 weatherization technicians were hired and trained, 5 new vehicles were secured, an additional \$ 20,000 worth of equipment and tools were purchased and we managed to gear up production significantly. For instance, 414 of the 1,000 homes we have weatherized in Duluth since August, 1977 were completed during the last 6 months of 1980. Rather than return to lower production in January when our 1980 money ran out, our new contracts for 1981 were written for six months only, with assurances that if we completed our contract by June, Federal Weatherization funds from States which were not producing would be reallocated to States which were. However, nationally, Weatherization Assistance Programs are completing approximately 25,000 homes per month, with monthly expenditures of 25 Million dollars. At this rate, projected funds for reallocation (50 Million) in June will last for only two months and we will be faced with massive lay offs of highly skilled workers and the idling of valuable program assets (vehicles and equipment). Of course, if the Weatherization Program is cut entirely from the 1982 budget, this situation will be permanent.

Our research indicates that in Duluth alone, conservation efforts on the 610 homes completed in 1980 will result in annual savings of \$120,000 at current fuel prices. Extrapolated for five years, without consideration for rapidly escalating fuel costs, this represents an economic return of \$600,000 on the initial \$61,000 federal investment. At a time when the elderly and those on fixed incomes in Duluth are using almost 50% of their gross income for heating costs during winter months (again, at current fuel prices) the need for conservation is critical. In addition to the fact that weatherizing low income homes allows individuals more economic freedom, the impact on the community cannot be ignored. The \$600,000 saved during the next 5 years in decreased fuel bills will be utilized by those households to purchase goods and services within this City. The effects of inflation, loss of State revenues, and the high energy costs (9,757 degree days) are creating serious problems for Duluth's economic base. Dollars which

House Sub Committee on Interior Appropriations

Public Hearing, February 19, 1981

stay in the local economy, rather than rising out of unweatherized homes, contribute to a healthier economy for all citizens.

Keeping in mind that the program here in Duluth is only one of 900 nationally delivering the Weatherization Assistance Program, and that the decontroll of oil and gas will ultimately intensify the current crisis that low income people in cold weather states will face, the elimination of the Weatherization Assistance Program will have a dramatic impact on the poor and elderly, and will be counter productive to economic growth.

In Duluth we have 6,000 low income homes left to weatherize, and currently our waiting list exceeds 400. Nationally, only 500,000 of the 12.5 million eligible homes have been completed. It hardly seems possible that federal energy policy would not include a commitment to conservation. In order to survive without wasting valuable program resources, Weatherization Programs need a supplemental appropriation for 1981 of \$100 Million, and an appropriation for 1982 of \$300 Million.

At a time when the poor are facing critical choices between heating or eating, and freezing to death has already become a reality, the miniscule amount of federal aid (given the 735 Billion dollar budget) for initial investment in a guaranteed high return program seems small indeed.

Please feel free to contact me at any time for additional information.

cc: Senator David Durenberger
 Senator Rudy Boschwitz
 Representative James Oberstar
 Representative Martin Sabo
 Governor Al Quie
 Mayor John Fedo

Industrial Conservation with Biphase Technology

Industrial energy conservation is the most immediate way to increase industrial output. New technology is being developed with DOE support which will increase plant output in the petroleum, steel, chemical, and other industries while reducing oil consumption. Successful development of this technology is essential to remain competitive with foreign industry (such as Japan and Germany) where extensive industrial conservation has been a fact of life for many years.

The Biphase turbine is a new device which produces power from the high pressure liquid/gas mixtures found in many industrial processes. The energy in these mixtures is now being thrown away in most processes because an efficient, simple two-phase turbine has not been available.

More than 50 million barrels/year of oil can be saved with the application of this turbine. Increased output of chemicals such as propylene and ethylene and liquified natural gas would result. These figures are documented in the report of an industry-wide survey done for the Division of Industrial Conservation of DOE.

The next step in this important program is demonstration of the Biphase turbine in actual processes. Historically, the process industries do not pay for the development of new machinery. However, if interested in the advantages, they will cooperate by providing their process for demonstrations.

The proposed Biphase program included in the FY81 budget is the demonstration of the Biphase turbine in key processes. Operation will be verified for the following applications:

1. oil/gas separation
2. ethylene production
3. paper production
4. natural gas purification
5. industrial boiler blowdown
6. coal gasification pressure letdown
7. ammonia production

Cooperation has been pledged by ARCO, EXXON, St. Regis, Dow, Bechtel, Allied Chemical and Pullman Kellogg. The program will cost \$2.1 million for two years and will culminate in a full size process demonstration.

The commitment by industry of their processes and resources to this program is evidence of their support and recognition of the need for the Biphase turbine. The DOE's recognition of this need should be followed by a prompt approval of the funds committed for this program and other important industrial conservation activities in FY81.

Conditions Affecting Investment

It is unlikely Research-Cottrell could invest in the Bi-Phase concentrator without federal participation for several reasons:

- (a) Limited capital availability
- (b) The need for DOE's "stamp-of-approval"
- (c) Industrial suspicion of high technical/economic risks in a regulated economy

(A) Capital Availability

More than two thirds of Research-Cottrell sales are tied to pollution control markets. The firm is engaged in constructing large facilities such as scrubbers, cooling towers and precipitators for utilities, which in itself is a high risk business. Since 1975 the business has become more risky because of conflicts over the Clean Air and Clean Water acts and this resulted in marginal profitability.

Competitors such as Envirotech have sold off their air pollution divisions, Combustion Equipment Associates is in Chapter 11 proceedings and Peabody International has restructured its company to separate its pollution control business from its more profitable energy business.

Research-Cottrell's return-on-sales from 1975-1979 averaged 2.5% roughly equivalent to the pollution control industry average. In 1979 its return was 1.7% on sales of 290 million. This is an inadequate return to sustain major capital investments. Consequently, the firm followed the industry pattern by switching investment to energy markets where returns are more favorable.

(B) DOE's Stamp-of-Approval

Regulatory and R&D funding agencies create in the marketplace the need for a stamp-of-approval on high technology. What the agency funds, the agency promotes to prove the funds were spent wisely (see DOE publication: The Energy Insider). This policy mandates obtaining DOE participation in R&D development.

(C) Industry suspicion

By-and-large industrial users will not fund demonstration of a new technology for reasons already cited, because risk-of-failure or disruption could be extremely costly and because of demands for capital. It is more practical to let someone else be first.

This is particularly the case in this era of federal participation in developing new technologies. It makes sense for customer industries to screen DOE conservation technologies since they will be wrung-out during demonstration and save capital for new product development.

General

While it is true industrial users of energy are conserving energy, much of the progress has resulted from smarter housekeeping measures. We may have reached a point of marginal return for such measures. Ordinarily, this condition would call for installing new, more productive technologies with higher yields. However, energy-intensive industries face exceptional demands for capital to modernize facilities and to meet environmental and safety standards. The high cost of capital and sharply fluctuating business cycles encourage investment in near term, quick pay-off facilities. Such has been the track record in the '70's and we have more reason to believe the trend will continue until the economy is brought under control.

So it is desirable to reduce or eliminate federal participation in the marketplace but the withdrawal should be gradual. Elimination of large ticket, ready-for-commercial R&D should be conducted first. However, it may continue to make sense to participate in such embryonic high risk technologies as the Bi-Phase concentrator, because of their potentially significant impact on national policy.

FY 1982 CONGRESSIONAL BUDGET REQUEST

Energy Conservation
Conservation

(Tabular dollars in thousands. Narrative material in whole dollars.)

	FY 1980 Appropriation	FY 1981 Appropriation	FY 1982 Base	FY 1982 Request
Industrial Energy Conservation (CS)				
Waste Energy Reduction:				
Operating expenses.....	\$16,450	\$24,800	\$24,800	\$16,698
Capital equipment.....	0	0	0	0
Subtotal.....	\$16,450	\$24,800	\$24,800	\$16,698
Industrial Process Efficiency:				
Operating expenses.....	\$20,675	\$36,800	\$36,800	\$15,546
Capital equipment.....	0	1,000	1,000	1,000
Subtotal.....	\$20,675	\$37,800	\$37,800	\$16,546
Industrial Cogeneration:				
Operating expenses.....	\$10,750	\$16,500	\$16,500	\$ 9,496
Capital equipment.....	500	0	0	0
Subtotal.....	\$11,250	\$16,500	\$16,500	\$ 9,496
Implementation and Deployment:				
Operating equipment.....	\$ 9,800	\$ 7,500	\$ 7,500	\$ 5,560
Subtotal.....	\$ 9,800	\$ 7,500	\$ 7,500	\$ 5,560
Program Direction.....	\$ 2,067	\$ 3,100	\$ 3,318	\$ 3,318
Total, operating expenses.....	\$59,742	\$88,700	\$88,918	\$50,618
Total, capital equipment.....	\$ 500	\$ 1,000	\$ 1,000	\$ 1,000
Total, Industrial Energy Conservation..	\$60,242*	\$89,700*	\$89,918	\$51,618

*A proposed rescission of \$35,800,000 congressional add-on's included in this total will be submitted later. See summary of rescission request following the summary of changes.

Authorization: Energy Policy and Conservation Act PL 94-163, Title III, Part D
National Energy Conservation Policy Act PL 95-619, Title IV, Parts 3 and
4 and Title VI, Parts 1 and 5
Non-Nuclear R&D Act PL 93-577
Energy Reorganization Act PL 93-438
Department of Energy Organization Act PL 95-91
Energy Security Act, PL 96-294, Title V, Subtitle C, Section 591

SUMMARY OF CHANGES

FY 1981 Appropriation Enacted.....	\$89,700
Built-In Increases and Decreases:	
Program direction pay raise supplemental.....	+218
FY 1982 Base.....	\$89,918
Program Increases and Decreases:	
Waste Energy Reduction (-\$8,102)	
Completion of one-time studies and analyses.....	-300
Continuing efforts which were fully funded in FY 1981.....	-5,145
Projects stretched out in FY 1982.....	-630
Increased decentralization and field support.....	+580
Project completions in FY 1981.....	-1,232
Projects entering less expensive phases.....	-3,011
Projects entering more expensive phases.....	+1,636
Industrial Process Efficiency (-\$21,254)	
Completion of one-time studies and analyses.....	-75
Efforts continuing in FY 1982 for which FY 1981 activity was funded in FY 1980.....	+1,280
Increased efforts in chemicals.....	+256
Projects fully funded in FY 1981.....	-2,315

Projects completed in FY 1981..... -2,047
 Projects entering less expensive phases..... -4,097
 Projects entering more expensive phases..... +3,210
 Formed coke projects for which FY 1982 activity was funded..... -12,800*
 in FY 1980 and FY 1981 and is to be rescinded
 Project stretchouts in FY 1982..... -4,666
 *An additional \$5,000,000 is to be rescinded from FY 1980 carryover.
Industrial Cogeneration (-\$7,004)
 Projects advancing to more expensive phases..... +2,296
 Projects entering less expensive phases..... -2,641
 Projects funded in FY 1980 for FY 1981..... +807
 Increased support at Argonne Lab..... +114
 Completion of one-time studies and analyses..... -1,370
 Projects for which FY 1982 activities were funded in FY 1981..... -4,250
 Projects stretched out..... -1,960
Implementation and Deployment (-\$1,940)
 Completion of one-time studies and analyses..... -700
 Activities completed in FY 1981..... -860
 Activities entering less expensive phases..... -220
 Activities entering more expensive phase..... +180
 Increased technology transfer..... +1,160
 Discontinue boiler training workshops..... -1,500
Program Direction (No Change)
 FY 1982 Budget Request..... \$51,619

Summary of Proposed Rescission to be Submitted: The changes in the FY 1981 appropriation resulting from the rescission request are summarized by subprogram as follows:

FUNDING SUMMARY OF PROPOSED RESCISSION			
SUBPROGRAM	FY 1981 APPROPRIATION	PROPOSED RESCISSION \$000	REVISED ESTIMATED OBLIGATIONS \$000
Waste Energy Reduction	~~\$24,800~~	~~\$5,000~~	~~\$19,800~~
Industrial Process Efficiency	37,800	22,800*	20,000
Industrial Cogeneration	16,500	4,500	12,000
Implementation and Deployment	7,500	3,000	4,500
Program Direction	3,100	500	2,600
TOTAL:	\$89,700	\$35,800*	\$58,900
*Of this, \$5 million is from FY 1980 carryover originally intended for the formcoke project.			

PROGRAM SUMMARY OF PROPOSED RESCISSION		
SUBPROGRAM	PROJECTS IMPACTED	\$000
Waste Energy Reduction	Fluidic high temperature sensor, ~~Bi-Phase Concentrator~~ , slagging burner, chemical heat pump, comminution and blasting and conversion of industrial waste to oil.	\$ 5,000
Industrial Process Efficiency	Advanced catalytic reactor application, continuous refining of vegetable oil, computer controls and sensors in paper making, new pulping process, advanced copper reduction, formcoke and pellet coke.	22,800*
Industrial Cogeneration	Advanced bottoming cycles, closed cycle gas turbine and thermionic topping cycles.	4,500
Implementation And Deployment	Conduct 40 boiler training workshops and expand Energy Analysis and Diagnostic Centers from 6 to 16.	3,000
Program Direction	Add 15 additional direct program staff positions.	500
TOTAL.....		\$35,800*
*Of this, \$5 million is from FY 1980 carryover for formcoke project.		

Objectives and Federal Role: The Industrial Energy Conservation Program seeks to increase energy use efficiency and promotes the substitution of abundant fuels for scarce fuels in the industrial/agricultural sector. The program focuses on cost-shared RD&D for new high-risk technologies; encourages the use of existing technologies which are inadequately utilized; monitors the progress of energy conservation in the most energy-intensive industries; and expedites the implementation of new and existing technologies by the private sector. The program, revised to include the requirements of the National Energy Act and reflective of national economic objectives, has estimated energy savings goals of 1.0 quads annually in the near term and 5.5 quads annually in the mid term.

In FY 1982, the Industrial Energy Conservation Program activities will undergo significant change. Programs funded by the budgets of FY 1980 and FY 1981 will be carried out, several RD&D efforts will be completed in FY 1981, there will be no new starts in FY 1982 and starting in FY 1982 the plan will focus on only the most cost effect opportunities assuming a similar level of funding in the out years.

The Federal role in industrial energy conservation RD&D relates to a variety of factors and is sometimes not immediately apparent. The fact that the industrial/agricultural sector consumes more of the U.S. energy (37.8%) than any other sector and that the energy is used very inefficiently (as low as 10 percent in some direct heating processes) leads to the conclusion that efforts directed to energy conservation in industry can yield substantial results.

The issue then becomes that of who should take the action. Private industry, on its own, has taken and will take significant energy conservation actions. There are many categories of activities, however, that the private sector will not expeditiously pursue alone for a variety of basic reasons which vary from industry to industry. Even in the most energy-intensive industries, energy may be a small fraction of product cost. This fact, coupled with the technical and economic risk in major production facilities, provides little incentive for private sector pursuit of high-payoff, high-risk energy conservation technology development, especially in the presence of higher priority demands (such as Occupational Safety and Health Act (OSHA) and Environmental Protection Agency (EPA) requirements, product improvement and market expansion) for the limited capital available. There also are technology developments which have multi-industry application that are not economically feasible for a single company without Federal involvement. It is also important to note that R&D investments by private industry are made mainly by a few dominant concerns within each industry. Results of these efforts are likely to be held proprietary by the few participating concerns, whereas Federal cost sharing would insure wide dissemination.

Each of the types of Federal role (incentives, information dissemination, cost-share RD&D and regulations) can be applied to achieve energy conservation in industry. Regulations, information, and incentives tend to be costly and stimulate the use of existing technologies, but do not significantly influence the development of new technology. Cost-shared RD&D of selected high potential technologies (which are outside the acceptance criteria for the private sector) is a proper Federal role for accelerating development of new technologies without duplicating private sector efforts.

Many potential new technologies could produce extremely significant energy savings. If the technical and/or economic risk exceeds that which industry normally undertakes, Federal support is essential if such technologies are to undergo accelerated testing and development. Industry decisions concerning new technology development relate to whether or not a shut down (for installation and/or failure during testing of new technologies) could seriously jeopardize production output, other precious capital investments and/or product quality.

If a given project is perceived to have these drawbacks, it is highly unlikely that an individual corporation would invest capital funds for demonstration, but would rather wait for some other group to perfect it. It is this type of project--high risk but also potentially high benefit--that justifies Federal involvement.

Accomplishments: The Industrial Energy Conservation Program currently consists of over one hundred individual projects focused on the highest priority targets. The relative maturity of the projects varies widely. Several previously initiated efforts are well into the demonstration phase and are already penetrating the market with measurable impacts. Others are in analytical, design, or fabrication phases. The following summarizes the accomplishments to date:

- o A successful demonstration was completed for fumes-as-fuel in paint curing/coil coatings and the technology is now being successfully commercialized by the private sector without further Federal assistance. To date, twenty-one additional systems have been installed and orders have been received for several others. The energy savings for this project total over 4.5 trillion Btu's actual to date and are continuing at a rate growing from the present 3.4 trillion Btu's annually. The Federal share of the contract was \$412,000 and there was a buy-back provision. On January 8, 1981, the contractor forwarded a check to DOE for \$216,000. Therefore, the Federal cost for a project which has already saved over \$13 million in energy is only \$194,000.
- o Successful pilot plant demonstrations have been completed for converting waste polypropylene to fuel oil. Three petrochemical concerns have full-size facilities utilizing this process and further market penetration appears encouraging. Waste polypropylene now constitutes about 300 million tons annually which is currently used as land fill. Savings from this project are estimated at potentially two million barrels of oil (12 trillion Btu's) annually by the year 2000 which at \$25 per barrel represents one hundred times the Federal investment of \$552,000.
- o A cost-shared development of foam finishing (foam replacing water in textile finishing operations) has resulted to date in the production of over eight hundred million yards in eighteen different mills using the new process. This project, to date, has saved over 600 billion Btu's which at \$3.50 per million Btu's represents over \$1,550,000 saved for a project with a total Federal cost \$662,000.
- o A metallic, cross-flow waste heat recuperator has been demonstrated on an aluminum remelt furnace successfully at over 85 percent effectiveness (compared to about 50 percent for existing designs). Projected savings for this advanced recuperator now being considered for commercialization by the Contractor on his own initiative are estimated at .3 quad annually in the mid term. As a stimulus to rapid implementation 20 installations will be Federally cost-shared and will be completed in late 1981.

- o An industrial cogeneration program was initiated in FY 1979 and currently three contractual efforts are in progress pursuant to development and demonstration of innovative topping cycles in new industrial applications (one in textiles, one in chemicals, and one in primary metals). By the end of FY 1981 Two additional projects will be underway (one in chemicals and one in petroleum refining). The impact of the Industrial Cogeneration program of the DOE Industrial Program is an estimated annual energy savings of .6 quad by the year 2000. This means an annual savings of \$24 for Each Federal dollar Invested.
- o Three activities directed at advanced aluminum processes are in hardware phases: pilot-scale tests have been conducted for substitution of coal for natural gas in aluminum remelt operations; an electrolytic aluminum smelter has been tested successfully with a wettable cathode for several months; and a small diameter shaft furnace has been designed, fabricated, and tested for direct reduction of aluminum. Based on the result, the project has been redirected to a shaft/arc furnace hybrid system. The estimated annual energy savings for these three projects is over .5 quad by the year 2000. This represents \$16 saved per year for each Federal dollar spent.
- o A biomass energy corn dryer has been developed, tested, and is being produced that utilizes crop residue in a direct fired furnace. It is expected that one acre of crop residue provides enough energy to dry five acres of corn. The thrust of this project has been to develop the prototype furnace and make the design details available to existing grain dryer equipment manufacturers. It is estimated that yearly energy savings from this project will be 0.012 quad by 1985, and 0.051 quad by 2000. The success of the project is already evident by the production model offered by the Sukup Company which has sold 4 units of 8 manufactured to date. A total of 28 units will be in operation at the end of FY 1981. Although not jointly developed with solar/biomass, the project does not duplicate activities of the solar organization which has been fully informed of the project.
- o The conservation of energy in the production of fertilizers in ammoniation-granulation plants has been significantly implemented by introduction of the pipe-cross reactor (PCR) which has been installed in 28 plants. The PCR consists of a 6-inch Hastelloy reaction tube (about 10 feet long) to which acids and ammonia used in making NPICS fertilizers are added to produce a hot melt. With the PCR, the amount of fuel required to granulate and dry the product is dramatically reduced or completely eliminated. Where dryer capacity has limited production in a conventional granulation plant, the PCR method can result in increases in production rates up to 650% without additional energy required. Currently, 12 million gallons of fuel oil equivalent are being conserved annually by the PCR. BY 1985, this number will increase to 43 million gallons annually. Expected energy savings from this project are estimated at .07 quad annually (which at \$3.00 per million Btu's equates to \$210 million saved per year) in the mid term for a total Federal cost of \$1.4 million. The first unit was sold commercially in May 1979.
- o A high effectiveness ceramic crossflow recuperator was successfully demonstrated over one year ago recovering waste heat up to 2600°F. To date, there have been a total of 34 installations by the private sector of this technology.

The planning of the program for FY 1982 was integral with the final plans for FY 1981 and considered all interim programmatic variations which affect allocations and projects within each of the subprograms. The following table summarizes the changes in projects and activities of the FY 1981 program since the initial budget formulation and the changes due to Congressional actions and regrouping of projects among the subprograms.

Prepared by:

Reviewed by:

Approved by:

Norman L. Halverson

Walter R. Studhalter

William E. Amend

Norman L. Halverson
Principal Scientist

Walter R. Studhalter
Project Manager

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Technical Director

SUBPROGRAM	FY 1981 BUDGET AUTHORITY*	PROJECT AND ACTIVITY VARIATIONS IN FY 1981
Waste Energy Reduction	\$24,800	Operational failure delayed reradiant recuperator demo High temperature materials support at Oak Ridge increased Advanced ceramic recuperator contractor was changed Tests of waste-as-fuels in lime kilns were completed Increased decentralization and support by national labs New projects by congressional add-on's; chemical heat pump, Bi-Phase concentrator, slagging burner, fluidic high temperature sensor, and comminution and blasting
Industrial Cogeneration	\$16,500	Tests of coal/water slurry in diesels were started Study of market potential was added Organic Rankine program was expanded Externally fired Brayton project was accelerated Studies were added for utility market and interchange New starts from add-on; closed cycle gas turbine, thermionic topping and advanced bottoming cycles
Industrial Process Efficiency	\$37,800	Preliminary effort started on low alkali cement Study of computer controls in steel was added New Project added for carbothermic reduction/aluminum Study was added for computer controls/general manufacturing Project started for evaporation by mechanical recompression Congressional add-on's; formcoke, pellet coke, advanced copper production, new pulp process, advanced catalytic reactor, sensor development, and vegetable oil refining.
Technology Deployment and Monitoring	\$ 7,500	Mechanized data processing was initiated A study was added for utility incentives Technology Implementation plans were expanded Add-on's by Congress; 40 boiler training workshops and an additional 110 Energy Analysis and Diagnostic Centers
Program Direction	\$ 3,100	Addition of 15 direct program staff positions from congressional add-on

*This does not reflect the impact of the rescission of FY 1981 congressional add-on's previously discussed.

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DRAFT

Biphase Energy Systems

A Research-Cottrell
Transamerica Delaval
Joint Venture

Report Number
DOE/ET/15350/A009-F

FINAL REPORT

For

GENERATION OF USEFUL ENERGY FROM PROCESS FLUIDS USING THE BIPHASE TURBINE

CONTRACT DE-AC07-76ET15350/A009

CONTRACT PERIOD: 1 Feb. 1980 - 30 Sept. 1980

Prepared for the
UNITED STATES DEPARTMENT OF ENERGY

August 29, 1980

Prepared by:

Reviewed by:

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SECTION 1

SUMMARY

Biphase Energy Systems has surveyed the six largest energy-consuming industries in the United States to determine the energy savings that could result from applying the Biphase turbine to industrial process streams. A national potential energy savings of fifty-eight (58) million barrels of oil per year has been identified. This energy is recoverable from flashing gas-liquid process streams and is separate and distinct from waste heat recovery. This energy is recoverable only by virtue of the unique characteristics of the Biphase turbine. No other device is currently available for recovering mechanical energy from flashing gas/liquid process streams.

The object of this program was to survey the six industries in the United States which consume the most energy and estimate the energy savings that could result from the application of the Biphase turbine. These industries were the petroleum (Standard Industrial Classification No. 29), chemical (SIC 28), primary metals (SIC 33), paper and pulp (SIC 26), stone-clay-glass (SIC 32), and food (SIC 20). It was required to determine the applicability of the Biphase turbine to flashing operations connected with process streams, to determine the energy changes associated with these flashes if carried out in a Biphase turbine, and to determine the potential plant and national energy savings that could result from using the Biphase turbine. The results of this investigation were to be reported as (1) a list of processes to which the Biphase turbine is adaptable; (2) a list of processes indicating the potential plant and national

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Technical Director

Walter R. Staudacher
Project Manager

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Principal Scientist

energy savings that could result from applying the Biphase turbine; and (3) a suitability rating of the processes. The latter includes consideration of capital costs, pay-back periods, market penetration and technical adaptability of the Biphase turbine. The availability of an industrial host for conducting planned demonstration tests was also included in the suitability evaluation.

Process flow diagrams for several hundred commercial processes were examined to identify process streams to which the Biphase turbine could be applied. When flashing process streams were identified, detailed process flow diagrams were consulted to obtain stream conditions (temperature, pressure, flow rates, composition) so that the power (kW) recoverable on a stream and plant basis could be determined.

Because of the innumerable potential processes only selected ones could be fully evaluated. A screening process was set up to permit the initial consideration of a large number of processes which was then selectively reduced to a more manageable level. First, flashing streams that existed in industrial plants were identified. Those having a pressure drop of less than 50 psi were eliminated. Stream and national energy calculations were performed for the processes which remained. A suitability rating was then developed for those Biphase turbine applications having the largest potential energy savings. More attention was given to those processes having large national production rates because of the potentially larger energy savings that could result.

Of the several hundred processes examined one hundred three were identified in which flashes occurred. Ten were identified in the petroleum industry, 91 in the chemical industry, one in the paper industry, one in the primary metals industry and none were identified in the stone-clay-glass industry. In addition to the above, three auxiliary operations were identified, each of which is applied to several processes. These were cryogenic refrigeration, gas purification and industrial boiler blowdown.

In addition to the process applications described above, results for utility boiler blowdown and feed water preheating were evaluated. As these are utility rather than industrial process applications the results are not totally within the scope of this study. They are included, however, because of the large potential energy savings that could result from application of the Biphase turbine to them.

Energy calculations were performed for twenty-two processes. Individual process streams are reported with potential power recoveries of 30 to 1600 kW. Total plant energy recoveries were obtained from summation of the power recovery of individual streams. Table 1-1 gives a summary of the six processes for which the Biphase turbine yielded the largest potential energy savings. Because of the limitations of this study the potential energy savings reported should be considered as being indicative of possible energy savings rather than as a limit which is unlikely to be exceeded.

Processes for which the potential national energy savings were substantial were evaluated further to determine the suitability for near-term commercial application of the Biphase turbine. Applicability of current Biphase technology, estimated capital costs of the turbine, payback period, and the identification of an industrial host for conducting industrial test were considered. Those processes with near-term potential are listed in Table 1-2. In each of these cases interest has been created with process designers and/or operators to work with Biphase and/or DOE to demonstrate the turbine. The interested process operators are also included in Table 1-2.

The other applications with large potential energy savings listed in Table 1-1 represent future applications which may require further technological development.

Table 1-1. Summary of Processes for Which the Biphase Turbine Offers the Largest Potential Energy Savings

Description	Oil Saved (10 ⁶ bbl/yr)
Utility Boilers	20.8
Coal Liquefaction*	16.0
Industrial Boilers	8.3
Gas Purification	3.3
Cryogenic Refrigeration	3.1
Low-Density Polyethylene	2.1
Total**	53.6
*This projected energy savings is based on the assumption that 10 coal liquefaction plants (30,000 tons/day) will be operational in 1990. **This total includes <u>only</u> the six specific applications referred to in this table.	

Table 1-2. Summary of Processes for Which Potential Savings Are Significant and for Which the Extension of Biphasic Technology Would Be Small

Description	Interested Process Operator
Cryogenic Refrigeration	Exxon
CO ₂ Absorption by Selexol Process	Allied Chemical
CO ₂ Absorption by Fluor Solvent Process	Fluor and El Paso Natural Gas
Oil/Gas Separation and Power Production	ARCO
Ammonia Production	Pullman-Kellogg
Industrial Boiler Blowdown	ARCO

COGAS Development Company

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COGAS®

Carroll A. Hochwalt, Jr.
General Manager

March 3, 1981

The Honorable
Sidney R. Yates
Chairman, Subcommittee on
Interior and Related Agencies
Committee on Appropriations
United States House of Representatives
Washington, DC 20515

My dear Chairman Yates:

I am pleased to submit the attached statement in conjunction with the February 19, 1981 Hearing of the Subcommittee on Interior and Related Agencies on Department of Energy Fossil Programs.

Respectfully,

Carroll A. Hochwalt, Jr.

CAHJr:ef
Att.

FEBRUARY 19, 1981

STATEMENT SUBMITTED TO

SUBCOMMITTEE ON INTERIOR AND RELATED AGENCIES

COMMITTEE ON APPROPRIATIONS
UNITED STATES HOUSE OF REPRESENTATIVES

HIGH BTU PIPELINE GAS FROM COAL
RELATIVE TO
A VIABLE NATIONAL SYNTHETIC FUELS PROGRAM

BY

DR. CARROLL A. HOCHWALT, JR.
GENERAL MANAGER
COGAS DEVELOPMENT COMPANY

FEBRUARY 19, 1981

Mr. Chairman and Committee Members:

My name is Dr. Carroll A. Hochwalt, Jr. I am General Manager of COGAS Development Company, a partnership of:

- Consolidated Gas Supply Corporation, a
Subsidiary of Consolidated Natural Gas
Company
- FMC Corporation
- Panhandle Eastern Pipe Line Company
- Tennessee Gas Pipeline Company, A division
Tenneco, Inc.

Three of these companies account for fifteen percent of the natural gas distributed in the United States. The fourth is a diversified manufacturer whose 1980 energy bill was 142.2 million dollars. I am pleased to present our views regarding high Btu pipeline gas from coal, and the importance of the Demonstration Plant Program to our national synthetic fuels program.

An expanded role for pipeline gas can bring us rapidly to a reduced dependence on foreign oil. "Lower 48" natural gas supply is projected to decrease by almost 56% by the year 2000. Supplemental gas-source projects can offset this supply decrease, but this is contingent upon the timing of these projects. An essential supplemental source is coal-derived SNG. Only with unrelenting effort can we have the necessary advanced low-cost gas-from-coal technologies ready for early commercialization. The supplemental Alaskan, Canadian, and Mexican gas, and LNG imports can hold the line until pipeline gas-from-coal can be brought on stream, but we must use this available time wisely.

Recognizing this need for synthetic gas as an essential supplemental supply, the gas industry has not only sought to overcome regulatory hurdles in pursuit of building synthetic gas plants using existing commercial technology, but has also invested substantial research and development resources in developing and demonstrating more economical advanced new technologies. It is only by virtue of such R&D investments that the United States can be assured of lowest cost gas for the greatest number of users.

The COGAS Development Company privately funded the development of the COGAS Process until it was ready for a demonstration plant program. A COGAS Process commercial plant, if it were in existence today, could market gas for less than five dollars per million Btu.

The COGAS Process is an American developed process. It is uniquely tailored to use all major types of U.S. coal (Western, Mid-Western and Appalachian). It is an efficient, integrated system of continuous coal processing.

Pipeline gas is the principal product. Synthetic high Btu gas is an essential component of the total domestic energy requirement for the 1990s. Gas is the lowest cost synthetic fuel, it is environmentally the cleanest fuel and a delivery network is already in place.

Liquids are produced directly and are an important co-product. The number two and number six fuel oils, and gasoline grade naphtha produced are useful to the consumer and refineries.

The COGAS Process was the process of choice by the Illinois Coal Gasification Group for its high Btu pipeline gas-from-coal demonstration project. ICGG selected the Dravo Corporation of Pittsburgh, Pennsylvania as the architect/engineer. This project has, for four years, been under rigorous DOE oversight and assessment which has continually reaffirmed the operability of the process as designed, the high probability of successful engineering scale-up, and favorable commercial scale product costs. The COGAS Process has emerged as the leader in a new generation of more efficient, reliable, environmentally acceptable pipeline gas-from-coal technologies.

FEBRUARY 19, 1991

The detailed engineering of the ICGG/COGAS/Dravo demonstration plant and the environmental studies will be complete at an early date. The demonstration plant is proposed to be jointly funded by government and industry. The intent of Congress, as expressed in the FY 1981 appropriations bill, is that the project proceed to plant construction, subject to completing a satisfactory Environmental Impact Statement and arriving at satisfactory business arrangements. Yet now we find that this important gas demonstration plant program is to be slowed, curtailed or stopped altogether under revised FY 1981 and proposed FY 1982 budgets.

A demonstration plant is the final stage in the development of sound, creative and more economical technology. It confirms publicly the engineering judgment that went into the design, it develops the cost numbers on which to base creditable commercial plant financial projections, it proves the environmental acceptability of the process . . . in short, it reduces the risks of commercial plants to the range experienced by capital intensive operations, generally.

Since the demonstration plant itself is capital intensive, there are few industrial research budgets that have the capacity to permit going it alone. Cost sharing by the Federal government and industrial sponsors is a sound approach to getting demonstration plants built and operating.

Specifically, in the case of the COGAS Process, the ICGG/COGAS/Dravo demonstration plant can provide a high level of benefit flow-back. Following operation as a pipeline gas production unit, the basic demonstration plant could, with design additions, be operated to demonstrate production of medium Btu fuel gas, methanol, M gasoline and other indirect liquids. The basic feature of operability on all U. S. coal types and concurrent production of direct liquids is retained.

In order that the high Btu pipeline gas from coal demonstration program in general, and the construction of the ICGG/COGAS/Dravo demonstration plant specifically, might proceed in an efficient manner, so that the benefits of this important pioneering technology may begin to accrue to the nation's energy needs at the earliest possible date, we suggest:

- Continuity of adequate funding under the Department of Energy until a resolution of the various funding proposals for demonstration projects is made by Congress.
- Amendment of the Synthetic Fuels Corporation charter to accommodate demonstration projects, if Congress concurs with the Administration's proposal to place projects in the SFC.
- A reaffirmation of the Congressional backing for the construction of the ICGG/COGAS/Dravo pipeline gas demonstration plant, subject to arriving at satisfactory business arrangements between the government and industry and completion of required environmental work.

Thank you.

Specifically, in the case of the ICGG/COGAS/Dravo demonstration plant, the project is a high level of technology. This plant will produce a high Btu pipeline gas which will be a significant contribution to the nation's energy needs. The project has been under rigorous DOE oversight and assessment which has continually confirmed the feasibility of the process as designed, the high probability of successful engineering design, and favorable commercial scale product costs. The COGAS process has emerged as the leader in a new generation of more efficient, reliable, environmentally responsible pipeline gas-from-coal technologies.

HOUSE SUBCOMMITTEE ON APPROPRIATIONSDEPARTMENT OF THE INTERIOR AND RELATED AGENCIES

My name is Dr. Donald A. Dahlstrom and I am Chairman of the Advisory Committee on Mining & Mineral Resources and Research which is in the Department of the Interior. I am also Vice President and Director of Research & Development for the Envirotech Corporation, a past President of the Society of Mining Engineers, a past President of the American Institute of Chemical Engineers, a member of the National Academy of Engineering and I live in Salt Lake City, Utah.

The Advisory Committee reports to the Secretary of the Interior by Federal law and is primarily concerned with state Mining and Mineral Resources and Research Institutes. Presently there are 31 institutes in 31 different state universities.

It has been brought to my attention that there is a recommendation for a 100% cut in the budget for Fiscal 82 for this program as originally recommended by the Congress. I strongly believe that such a cut would seriously effect our future production of minerals and this would be particularly true of critical minerals important to our defense effort, many of which we must now depend primarily on imports from politically unstable countries. It would also have a disastrous

effect upon mining and mineral engineering education and the number of capable faculty obtainable in the future.

I should like to acquaint the Subcommittee with the following facts:

1. According to the Bureau of Mines, we are now dependent on other countries for over 50% of 23 critical minerals, and many of these, such as cobalt, chromium, bauxite, manganese, and tantalum, we are 90 to 100% dependent.

At the same time, we have potential possibilities for all 23 minerals if we can develop the necessary technology.

We also have imports of \$108 billion in minerals which is presently increasing. Moreover, while our strategic stockpile goals are currently valued at \$20 billion, inventories on hand toward these goals are valued at only \$8 billion, leaving a shortage of \$12 billion.

2. For the development of this needed technology we are critically dependent on capable engineers in our future as well as the university faculties to teach them. If we are to carry out the synthetic fuels targets, this will literally require more engineers than can be obtained

and we will fall far short of our goals. Thus, the production of qualified engineers and faculty is critical to our future in minerals.

Looking specifically at the state Mining and Mineral Resource Research Institutes, the following facts should be considered:

1. We are seriously short of qualified faculty in these universities. John Slaughter, head of the National Science Foundation, pointed out just last month that we are 2,000 short of faculty in our engineering schools and I am sure we are proportionately short in mining and mineral engineering faculty. Furthermore, many of these same universities have had to obtain as much as 50% of their faculty from other countries to achieve even our present level.
2. Graduate school enrollment in engineering is now 50 to 60% foreign, not because of increased foreign enrollment, but decreased American citizen enrollment. This means we are planning even further faculty shortages in the future to additionally exacerbate the problem if we do not reverse this trend.

3. We are sorely in need of basic technological research in the mining and mineral fields to help to solve our problem. To do this, we must have qualified graduate students and capable faculties. Universities represent a very logical place to do this research as proven in our country's past.
4. In the Institute program in its short history of essentially only three years at the end of Fiscal 81, matching funds from the universities, the states and industry have been rapidly rising to approach those of the Department of the Interior for this effort. For example, in the three years the University of Arizona will have been in this program, it has received \$707,877 from this program but will have provided \$1,063,500 of matching funds and other monies. Thus, the Institute program does represent good "seed" money. If the program is terminated at such an early date, much of this expansion will be lost.
5. In its total four years of existence through Fiscal 81 with a continuing growth over this four years of Institutes and with only three years of research grants, just over \$12.6 million has been given for research grants and

just over \$11.6 million for the allotment program for a total of \$24.3 million. The latter permits the university to purchase much needed equipment for teaching and research. Again, the National Science Foundation has pointed out our universities are sorely lacking in such equipment if we are to produce qualified engineers. It also permits the universities to hire additional faculty, postdoctoral research people needed for this effort, outstanding visiting professors and further seed money for research and training of students.

To cut the budget 100% in Fiscal 82 would not only totally destroy the Mining and Mineral Resources and Research Institute program, but would lead to the further deterioration in the production of engineers badly needed by our country, and not only add to our increase in dependence on other countries for critical minerals but also further increase our dependence on mining and mineral engineering faculties from other countries. It would severely reduce future capable faculty members of American citizens from an already understaffed faculty and severely reduce our critically needed basic research in mining and minerals. It will further reduce our number of graduate students who will be critically needed for our future production of minerals for our defense effort and industrial production.

This program deserves your support and I would strongly request the restoration of this budget in Fiscal 82 to maintain it at an adequate level.

Testimony of Elburt F. Osborn
 Vice President for Research Emeritus
 The Pennsylvania State University

Before the Interior Subcommittee of the
 House Appropriations Committee, on Public Law 95-87,
 Title III--State Mining and Mineral Resources and Research Institutes,
 Hearings held on February 19, 1981

Mr. Chairman and Members of the Subcommittee: I am Elburt F. Osborn, a member of the Interior's Advisory Committee on Mining and Minerals Research, serving on this committee as the delegate of the president of the National Academy of Engineering. I served as chairman of this committee during the fiscal years 1978, 1979 and 1980, and testified before your committee during those first three years of the existence of the Mining and Mineral Resources Research Institute program.

I am very glad to be given this opportunity to again present testimony on Title III of Public Law 95-87. I would like to refer members of the subcommittee to my discussion, especially in the 1978 testimony, of the great need for the Title III program in order to improve the competence of our university faculties in the field of mineral resources research.

Strong congressional interest to establish the Mining and Mineral Resources Research Institutes in universities, through annual grants to the States, began in the late 1960's. The interest developed because of the clear need for an expanded program of research in our universities on the extraction, processing and utilization of the country's mineral resources. As clearly brought out in a National Academy of Sciences report of 1969, the mining and mineral engineering research in universities had not received comparable support to other science and engineering fields, and nothing whatsoever comparable to support of agricultural resources research. We have learned that the greatest progress in research is made when all three of government, industry, and universities have strong programs. Hence, the need for strengthening university mineral research programs was apparent.

The need is increasing for research in the mineral fields. We have all become aware of the seriousness of the mineral resources supply problems associated with petroleum. We are beginning to realize that we must also develop more certain supplies for mineral commodities other than just the fossil fuels. In this connection, I would like to quote a statement that appears on page 1 of the report, dated December 31, 1980, of the Committee on Armed Services of the House of Representatives, entitled, The Ailing Defense Industrial Base: Unready for Crisis. The statement: "a shortage of critical materials, combined with a resulting dependence on uncertain foreign sources for these materials, is endangering the very foundation of our defense capabilities".

Minerals especially important to the country's defense are frequently referred to as strategic minerals. They play various roles, as for instance to increase resistance to high temperature and to corrosion and erosion.

Examples, with percent of each that is imported shown in parentheses, are: titanium(47), nickel(73), chromium(91), cobalt(93), columbium(100) and tantalum(97), all required in the manufacture of the Pratt & Whitney F-100 Turbofan engine for F-15 and F-16 planes. Other especially strategic minerals are: manganese(97), aluminum(94), platinum-group metals(87), tin(58), and iron ore(22). Although we import only 22% of our iron ore, nevertheless a stoppage of this supply could be disastrous to our iron and steel industry. The point is, that besides our dangerous dependence on imported petroleum, we have these other minerals where we must find ways to provide a domestic supply in case of an emergency. Of course, importing of materials is not all bad. We must import in order to carry on world trade. I am simply emphasizing that we must do the research needed to discover and extract the minerals considered strategic. Our nation is blessed with great mineral resource potential. With appropriate research in the mining and mineral engineering fields, we can go a long way toward eliminating dependence on unreliable, foreign sources for the strategic minerals.

It was the intent of the Congress that the Title III program would stimulate increased research in universities in the more basic aspects of the discovery, extraction, processing and utilization of the nation's mineral resources, thereby doing for mineral resources something similar to that done for agricultural resources by the Hatch Act of 1887. By this Act, as you know, an agricultural experiment station was established at a Land Grant College in each State. With the increasingly precarious situation relative to our importing of strategic minerals, the wisdom of the Congress in establishing the Title III program, parallel to the Agricultural Experiment Stations program, is becoming more and more apparent.

The Title III program now provides funding for an Institute in each of 31 States at an appropriate university. Federal funding for an Institute is not large, but this funding is of critical importance. In addition to the required matching by non-federal funds, the grants are acting as a nucleus to which are being added State and industrial funds, and contract research funds from federal agencies. There has developed, therefore, a multiplier effect, so that in many of the States the mineral research programs are being funded by several times the amount of the federal grant. Further, in several of the institutions, where departments of mining engineering had been closed, these are now being reestablished, as at the University of California (Berkeley), University of Alabama and University of Kentucky.

The Title III appropriation is largely in two parts: Sec. 301 and Sec. 302. The former provides an equal grant to each State. This is a basic allotment that is matched from non-federal funds, and from which indirect costs are not deducted by the institution. The Sec. 301 allotment is of the nature of continuing funds, and therefore extremely valuable in building up a strong research faculty. The Bill authorizes \$200,000 as the allotment for the first year, \$300,000 for the second year, and \$400,000 for each fiscal year thereafter. The Congress, therefore, clearly intended that the Sec. 301 funds would increase in the first few years to allow growth of the program. This has not happened. The allotment was \$110,000 for the first year, and now in the fourth year is still \$110,000. I strongly urge that this allotment, for Fiscal year 1982, the fifth year of the program, be increased at least to the amount that was authorized for the first year (\$200,000).

Sec. 302 funds are to support research grants based on proposals received from the Institutes. This funding for Fiscal Years 1980 and 1981 was approximately \$6,900,000. I suggest that this funding be at the same level in 1982, but would further suggest that the Congress stipulate that emphasis in the program be placed on that research most applicable to the nation's strategic mineral needs. I would also suggest that no funds be used for undergraduate scholarships. The Congress clearly intended this to be a research program. Further, undergraduate enrollment in mining and mineral engineering has increased dramatically during the past few years, hardly justifying special federal scholarships.

My budget recommendation for Fiscal Year 1982 is as follows:

Sec. 301 (31 institutions @ \$200,000)	\$ 6,200,000
302	6,900,000
306	600,000
307	<u>100,000</u>
	\$13,800,000

Elburt F. Osborn
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Frank C. Fogarty
President

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81CDIF-075

March 7, 1981

The Honorable Sidney R. Yates
U.S. House of Representatives
Washington, D.C.

Dear Representative Yates:

Enclosed is a copy of written testimony I am submitting to your committee in conjunction with the Department of Energy's Magnetohydrodynamics (MHD) program.

Sincerely,

F.C. Fogarty
President

PREPARED TESTIMONY

ON THE MAGNETOHYDRODYNAMICS (MHD) PROGRAM

To the Subcommittee on Interior
Committee on Appropriations
U.S. House of Representatives

March 6, 1981

By

Frank C. Fogarty

President

MOUNTAIN STATES ENERGY, INC.

P.O. Box 3767

Butte, Montana 59702

Mr. Chairman and members of the Subcommittee, I am pleased to have the opportunity to present this testimony in support of the Department of Energy's magnetohydrodynamics (MHD) program.

My name is Frank Fogarty and I am president and general manager of Mountain States Energy, Inc., which operates the MHD test facility in Butte, Montana, under contract to the U. S. Department of Energy.

The Butte test site, which is called the Component Development and Integration Facility (CDIF), is a 50 megawatt thermal facility designed and constructed for conducting the engineering scale testing of MHD components and systems necessary to develop the process of MHD electrical power generation.

I will outline the advantages of the MHD process, describe the potential benefits of MHD for electrical power generation from coal in the coming decades, and review for you the progress to date at the CDIF.

The United States will be heavily dependent upon coal for electrical generation well into the 21st century. Utilities are steadily converting oil and gas fired plants to coal. Furthermore, the National Coal Association has urged the Reagan Administration to increase the pace of coal conversion. As a result of this expected heavy coal use, advanced fossil-fuel power generation technologies must be developed to assure cleaner more efficient use of the nation's coal reserves.

Electric utilities have continually expressed the need for more efficient, lower capital cost and more environmentally acceptable electrical generation plants. The utilities are primarily interested in development of processes which:

- 1) directly combust eastern or western coal at high efficiency--without extensive front end coal treatment, gasification or cleanup;
- 2) operate with very low environmental intrusion, and with a minimum of scrubbing or other exhaust gas treatment;
- 3) offer the possibility of lower cost of power--improved technology offsetting expected inflationary and regulatory cost pressures;
- 4) materially increase the efficiency of fossil-fuel power generation processes.

Advanced power generation technologies have the potential to significantly improve efficiency of electrical power plants, resulting in lower cost of electricity and extending the life of our coal reserves. Among the advanced coal to electricity conversion technologies being pursued are MHD, fuel cells, hot gas turbines and pressurized fluid bed boilers. Of these magnetohydrodynamics (MHD) is the only one which has the potential to fully realize the stated needs of the utilities.

The MHD process generates electricity by passing an electrically conducting plasma (hot gases obtained from coal combustion) through a magnetic field. The process converts the thermal energy of the hot gases directly to electrical energy. The MHD process is a high temperature process and the gases leaving the MHD generator still contain significant amounts of thermal energy. This energy can be used to produce steam which in turn can be used to drive a turbine generator. This combined cycle or double generating capability gives the MHD process

the potential to significantly increase the amount of electrical energy obtained from a ton of coal (50% more than conventional steam power plants).

The application of MHD for electrical power generation in an integrated power plant consisting of an MHD topping portion and a steam generating bottoming portion is not a proven concept. Strong research programs of recent years, sponsored primarily by the U. S. Government, have resulted in significant advancement of the technology and must be continued.

Research on MHD in recent years has verified theoretical predictions for MHD process performance. It also has resulted in a definition of the technical issues which must be answered by engineering development and testing prior to scale up for a commercial scale MHD power demonstration plant. Risk still exists in the development of the major MHD components (coal combustors, channels, magnets and inverters), as well as in the systems required to interface with the steam generating bottoming portions of the plant (heat recovery/seed recovery systems). Additional research is needed to complete the development of the process and assure successful commercialization of the technology by the utility industry.

The Government has built and in 1980 placed in operation two unique process development facilities for engineering scale MHD tests (up to the 50 megawatt thermal power level). These facilities are the CDIF in Butte, Montana, and the Coal Fired Flow Facility (CFFF) in Tullahoma, Tennessee.

At the CDIF, we successfully operated the facility support systems and conducted the initial tests of some MHD components in December 1980 and again in February of this year. These tests involved operation of an

oil fired combustor and included injection of coal ash to simulate coal combustor operation. These tests, which operated the combustor at its design specifications (50 MW), verified facility capability to support the electrical power generation test planned later this spring. The enclosed attachment (Attachment 1) has more detail on the CDIF status and testing schedule.

Both the CDIF and the CFFF have completed initial plant operations and are presently producing data in support of the national MHD testing program. Testing at these facilities over the next five years, if adequately supported, will produce the engineering data required to design a commercial scale MHD power demonstration plant. In the absence of such engineering data, scale up to commercial demonstration plant size from research data would represent excessive and unacceptable risk to industrial and utility users.

If commercialized by 1990 MHD would become a significant factor in the replacement of older worn out conventional coal fired power plants and additional new capacity. The potential benefits compared to the cost required to achieve commercialization of the technology are tremendous. For example, if during the 1990-2000 decade MHD captured only 50% of the replacement and new capacity, the savings in coal in the year 2000 would be in the order of 250 million tons, which at today's prices would be valued at over \$6 billion.

Because of the high temperatures required for the MHD process, the technology offers unique potential for cogeneration, particularly in energy intensive industries such as primary metals and chemicals. In addition, MHD has produced and continues to offer technological spinoffs

in areas such as high temperature materials, combustion phenomena, plasma physics and diagnostics, magnet technology, inverter and power conditioning technology. Additionally, MHD can be adapted on a small scale to processes or equipment requiring short duration high power energy pulses such as laser and particle beam weaponry. Extensive research on such applications has been done and is continuing in France and the Soviet Union.

Other countries are researching and developing MHD, including the Soviet Union, Poland, Japan, and China. The Soviets have announced plans for a 500MW MHD power plant which is scheduled to be operational in 1985.

Although the potential benefits of the technology are great, the electric utility industry does not have the financial ability to do MHD research on its own. The industry is strictly regulated by state utility regulatory commissions. The argument that the oil industry can take over research into synthetic fuels, as the price of oil and natural gas is deregulated, does not apply to the utility industry. Deregulation of fuel prices will create further adverse economic conditions for electric utilities. The industry will need new technologies to enhance electric energy productivity per unit of fuel consumed, but due to lack of funds it will not be able to develop such technologies without government support. Attachment 2 provides more detail on potential benefits of MHD.

In summary, MHD has much to offer. It has the potential to extend this nation's coal reserves. It can benefit the electrical industry and consumers with more efficient, more environmentally acceptable and less

expensive power generation, has the potential to produce significant technological spinoffs, and has potential defense and military applications.

A summary of the key aspects of MHD is provided in Attachment 3.

In presenting the case for MHD I am not arguing against any other type of energy technology. If the U. S. is to achieve high energy productivity and lessen reliance on imported oil then we must have a mix of technologies. We cannot afford to arbitrarily terminate any reasonable technology in its early or intermediate R&D cycle, without sound technical reasons. If the Federal Government is to play an effective role in energy R&D then it must develop technologies until industry is capable (financially, technically) of carrying forward the development, demonstration, and commercialization.

CDIF STATUS

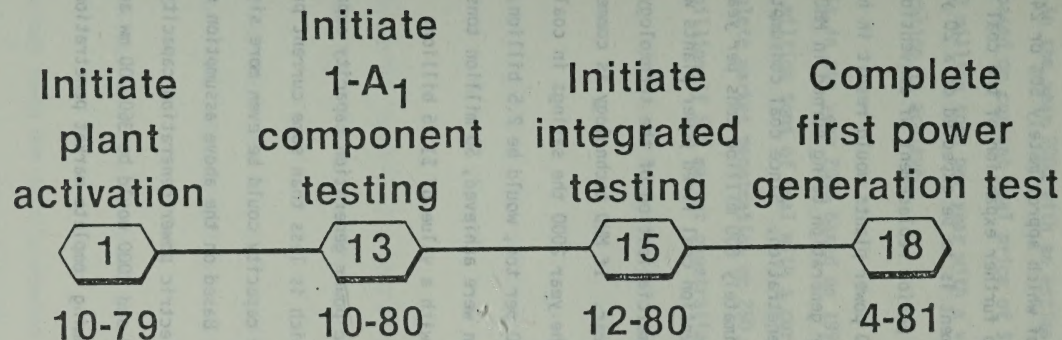
The role of the CDIF is to provide Engineering scale testing, at the 50MW thermal level, of MHD component and subsystems. Testing activities can be accomplished utilizing oil or various domestic coals as fuel.

With the preparation of a facility power generation test schedule in June of 1979 and the implementation of a disciplined management approach emphasizing schedule and budgetary commitments, all technical milestones have been met and successfully accomplished. In addition, these accomplishments were in accordance with programmatic direction and well within line item budgeting consideration.

To date, the overall facility is 95% complete, with all systems required to support oil-fired operation being complete and operational. The remaining work to be accomplished involves these items relating to the coal processing and delivering systems.

In preparation for initial MHD power generation testing, scheduled for May 12, 1981, the facility, including oil-fired combustor operation has been accomplished on 14 occasions, during December 1980 and February of this year. Four of these test runs were in excess of 4 hours each to verify the combustor design and the facility support systems ability to support electric power generation. All tasks leading to this milestone are on schedule and no problem areas have been encountered to prevent this major accomplishment.

CDIF Schedule



SA 220000 12415 174-00 000 000 000 000

X
X EVERY MAJOR MILESTONE ON THIS SCHEDULE ESTABLISHED X
X ON 6-19-79 HAS BEEN MET AND POWER GENERATION IS 6-19-79 X
X ON SCHEDULE. X
X

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Potential Benefit of MHD

The U.S. currently has about 480,000 mw of installed electric power generating capacity of which approximately 50% or 240,000 mw is coal fired. If there is no further expansion of the coal fired plants, then a 5% per year replacement is to be expected on a 20 year life. Therefore, over a ten year period replacement of conventional coal fired power plants with MHD power plants would result in half of all coal consumed for electric power generation being burned in MHD plants, assuming complete market penetration. Since coal consumption for electric power generation is approximately 600 million tons per year, the replacement of worn out convention coal fired power plants with MHD plant would, ten years after commercialization of the technology, save 100 million tons of coal per year. If MHD technology is commercialized by 1990, this means that in the year 2000 the savings in coal, based on the current price of \$25.00 per ton, would be 2.5 billion. Even if only 50% market penetration were achieved, 50 million tons of coal could be saved in the year 2000 with a value of \$1.25 billion.

If coal fired electric power generation capacity expands by approximately 50% per decade, which is less than some current projections, then impacts resulting from new capacity could be even more significant than for replacement capacity. Based on the above assumption of 50% per decade expansion in coal fired electric power generation capacity, estimated capacity in the years 1990 and 2000 would be 360,000 mw and 540,000 mw respectively. Again, assuming complete market penetration new capacity

Potential Benefit of MHD

over the period 1990 to 2000 would result in coal savings of approximately 400 million tons in the year 2000 with an estimated value of 10.0 billion dollars based on current coal price of \$25.00 per ton and approximately 200 million tons per year with a value of \$5.0 billion if 50% market penetration is achieved.

Total benefit in the year 2000 based on 1990 commercialization of MHD would be 500 million tons of coal with a current value of \$12.5 billion with complete market penetration or 250 million tons of coal valued at \$6.25 billion if 50% market penetration is achieved.

MHD TECHNOLOGY SUMMARY

- The electric power industry must rely on the Federal Government for development of advanced power conversion technologies.
- The electric power industry relies and will continue to rely heavily on coal.
- MHD, through a more efficient conversion process, is potentially capable of producing 50% more electricity per ton of coal than existing direct combustion power cycles.
- MHD power plants are expected to produce electricity at a cost lower than existing coal-fired steam power plants.
- MHD power plants are projected to meet all existing and planned environmental regulations.
- The scientific base for MHD is well established. No technological breakthroughs are required for the development of the technology.
- All technical milestones to date have been met, experimental data have been verified theoretical predictions of MHD component performance.
- The technology is deployable by the early 1990's or earlier.
- The potential benefit from commercializing MHD power generation technology far outweighs the cost of such development.

MHD TECHNOLOGY SUMMARY

- Because of the unique regulatory requirements of the electric power industry, the industry cannot support development of the technology itself but must rely on the Federal Government.
- The CDIF, which is 95% complete, was constructed within line item budget and on schedule based on programatic direction.
- The CDIF activation and initial testing is proceeding within budget and on schedule.
- CDIF began initial testing with an oil fired MHD combustor in December, 1980.
- Clean, efficient utilization of coal supports national energy policy of reducing dependence on foreign oil.
- MHD R&D has produced and is continuing to offer high potential for technological spinoffs in areas such as high temperature materials, application of lasers, combustion phenomena, plasma physics and diagnostics, magnet technology, inverter and power conditioning technology, etc., which have other industrial and military applications.

FEDERAL FUNDING FOR THE DEPARTMENT OF ENERGY'S
MAGNETOHYDRODYNAMICS (MHD) DEVELOPMENT PROGRAM

Statement by

Warren P Schmechel
President
The Montana Power Company

Before the
Subcommittee On Interior
of the
Committee On House Appropriations
Honorable Sidney R Yates, Chairman
Washington, D C

March 12, 1981

Mr Chairman, my name is Warren P Schmechel, President of The Montana Power Company, an electric and natural gas utility doing business primarily in the state of Montana.

I respectfully submit these remarks to outline the potential benefits that could come from a continued adequate funding of the Department of Energy's program to develop the coal-fired, open cycle magnetohydrodynamics (MHD) technology.

MHD could, in my judgement, produce electricity at a higher efficiency, lower cost and with less environmental impact than any of the other direct coal burning technologies of today. The United States, and the utility industry in particular, needs a technology having this potential. The utility industry, however, does not have the financial resources to develop this concept to a point where it will be deemed commercially demonstrated. The current DOE program and test facilities have resolved major research questions. The effort now is directed toward solving remaining problems dealing with the material and engineering elements of the technology. The opportunity for advancing coal utilization efficiency by as much as 50 percent is almost within our grasp. This combination of assets offered by MHD is simply too great to discard or neglect at this critical time. It requires the support of the United States government to bring it to fruition.

Confidence in the MHD technology is justified because

MHD is the only advanced technology that has consistently met or bettered the development goals set for it almost ten years ago. Every study made to date, government and private, shows that MHD offers the best combination for producing the lowest cost electricity, lowest pollution impact and lowest capital cost combined with the highest thermal efficiency.

Several years ago MHD was incorrectly assessed as having technical problems that had little or no chance of solution. MHD has outlived that obituary. Now, with eight years of further research and development, significant advances have been made; we are now assured of acceptable solutions in all major technical areas. The problems remaining before us do not in any sense require scientific breakthroughs.

However, not to mislead anyone, MHD technology is still in the development stage, at a scale yet too small to demonstrate conclusively its full potential in meeting this country's energy needs.

The needs of The Montana Power Company in serving its customers are the same as those of virtually every other utility in the country. We must have an electric power generation technology which can:

1. Directly burn coal at high efficiency, without extensive front-end coal treatment, without gasification.
2. Operate with very low environmental intrusion and with a minimum of scrubbing and/or exhaust gas treatment.

3. Offer the possibility of lower cost of power, improved technology, offsetting expected inflationary and increased regulatory cost pressures.
4. Materially increase the efficiency of use of our fossil fuels in the conversion process.

Of all the electric producing energy conversion technologies studied by our Company over the past ten years or so, and I think that includes virtually everything promoted by both the DOE, EPRI and their predecessors, the MHD technology is the only one to my knowledge which has the potential to realize fully the four utility needs I have listed. I think our finding has been repeatedly confirmed since 1969 by a series of prestigious and competently done studies by various government agencies, private organizations and major electrical equipment manufacturers.

Support for MHD has been broadening within the utility industry as evidenced by the recently formed National MHD User's Group, an expanding group of utilities with representation from each geographical area of the United States. The Electric Power Research Institute (EPRI), an independent electric utility R&D organization, has included MHD research in its program for several years at a level consistent with its total budget. It is becoming increasingly evident to not only utilities but many other segments of our society that coal will have to serve as a major fuel for producing electric power in the immediate future. Burning it efficiently and cleanly is a must.

All of us are aware that oil and gas account for only 11 percent of known United States recoverable fuel resources, while those fuels meet about 75 percent of our energy demands. Coal makes up 77 percent of the nation's energy resources, while furnishing less than 20 percent of our energy needs. It is clear we should move to coal. Yet, as a nation, we seem to be reluctant to do this because we are not yet comfortable with the economics of cleaning up the waste products.

Permit me to illustrate:

- About 44 percent of energy used by electric utilities in 1974 came from coal.

- In 1980 coal used for generation of electricity had risen to only 49 percent, an increase of 5 percent, while total growth in electricity use had increased by 19 percent.

The most reliable industry and government projections of future growth and change in the electric utility industry energy demand indicate the need for a 114 percent increase by the year 2000. Sixty-nine percent of the total demand could and should be met by burning coal if the economics are attractive and better technology is available.

It is inconceivable that anything like this growth can be based on existing designs. The impact of burning coal 50 percent more efficiently through use of MHD would have a tremendous effect economically and environmentally in both power production and in mining the coal. I urge the government

to weigh carefully the importance of new, coal burning, electricity producing technology, and particularly the achievement of these goals when setting levels and priorities for energy R&D programs.

In presenting the case for MHD technology I am not suggesting that other technologies should not be supported. If the United States is to meet its energy objectives, then we must provide a mix of technologies.

It should be emphasized that MHD has not yet reached the point where it meets commercial conditions. Risks still exist. The need for government support still exists.

The government has built the Component Development and Integration Facility (CDIF) located in Butte, Montana, and the Coal-Fired Flow Facility (CFFF) in Tullahoma, Tennessee. Each of these installations has completed initial plant operations and is presently yielding data in support of the national MHD testing program.

The programs at these facilities over the next five years will produce the engineering data required to design a commercial scale MHD power demonstration plant. In the absence of this data, an attempt to scale up to a commercial demonstration plant size would represent excessive and unacceptable risk to industrial and utility users.

The MHD program meets the criteria established by OMB for continued funding. These criteria are:

1. Government support should be focused on longer term, high risk R&D with potentially high payoff.
2. Government involvement could continue only through "proof-of-concept" at the process development unit scale.
3. Nearer term technical support for processes would be limited to cases where government has a unique technical resource or facility.
4. Industry would be responsible for supporting demonstration and commercializing the technologies as they become economic.

MHD is and has been a longer term, high risk research effort with a substantial payoff approaching a 50 percent increase in coal conversion to electrical energy. The project is still in the proof-of-concept stage at the process development unit scale; the technical resource and facilities are in the hands of the federal government; and industry has proposed sharing follow-on demonstration support.

In response to calls for nonfederal participation in MHD development, we have seen the formation of the Industrial MHD Forum and an electric utilities working group. The state of Montana has allocated \$500,000 as an impetus to get the next engineering step in the national MHD program moving. My Company has formally proposed to the Department of Energy that the MHD Engineering Test Facility/Commercial Demonstration plant phase of the national program be integrated with our planned 350 MW steam plant (Resource 89) scheduled for 1989 start-up in Montana. We would provide site development and

support facilities for the hybrid MHD configuration.

Further, we would be willing to operate the facility and would contract to buy the electricity and steam produced by the government built MHD portion of the plant. We feel this program would result in a significant cost savings to the government compared to a stand alone Engineering Test Facility and would accelerate commercial demonstration of MHD technology. Our support, however, will depend on the successful resolution of outstanding technical issues. This requires that the MHD energy program be adequately funded.

In summary, there is still need for government funding of MHD. It is one of the few promising technologies that will move us from heavy dependence on gas and oil to the exotic and renewable resource technologies of the future.



Coal extraction and utilization Research Center

SIU

Southern Illinois University at Carbondale
Carbondale, Illinois 62901
618/536-5521

March 20, 1981

Mr. Fred Mohrman, Staff Assistant
Subcommittee of Interior
House Committee on Appropriations
B-308 Rayburn Office Building
Washington, D.C. 20515

Dear Mr. Mohrman:

Per your conversation with a member of my staff, Timothy Crawford, on 18 March 1981, I am submitting the enclosed document for submission as written testimony to be included in the materials to be printed as a result of hearings before the Subcommittee of Interior on 19 February 1981 regarding the Office of Surface Mining Budget.

I submit this document as Chairman of the Association of Mineral Institute Directors. The document is my assessment of the need for, and the accomplishments of, the Mineral Institute Program. I believe the Mineral Institute Program is serving the security of our nation by the development of an infrastructure which is beginning to address the research and training needs of the mineral industry.

I respectfully submit this document as written testimony on the Office of Surface Mining, Department of the Interior FY 1982 Budget, as it pertains to the Mineral Institute Program.

If I can provide you with any further information or assistance, do not hesitate to contact me.

Sincerely,

Lyle V. A. Sendlein
Director

LVAS/3S

cc: Michael Crow

Enclosure

Mining and Mineral Resources Research
Institute Program

SUMMARY

The Reagan Administration along with the numerous agencies that administer the governmental programs of our country, have undertaken an important and difficult task of reducing government spending and balancing the national budget. This is a task that certainly requires considerable diligence and effort in the assessment of the merits and needs of current programs. To assist you in this assessment, it is important that you understand the critical importance of maintaining the Mineral Institute program within the Department of Interior, Office of Surface Mining, because currently the President's budget seeks no funds for FY 82 to support this program.

The Mineral Institute program is now completing its third year of activity. This activity has seen mineral institutes established in 31 universities in 31 states that are now beginning to significantly address the mining and mineral resources training and research needs of the country. With the small amount of funds currently appropriated to date, they are now addressing some of the most serious national concerns that our country now faces. A description of the Mineral Institute program that now exists is attached to this statement as a reference document, however, critical concerns being addressed by the program follows:

The United States currently faces an alarming shortage of minerals and metals critical to the economic activity and national defense of our country. If you are concerned with the reliance of our country on the importation of oil from the Middle East, you will be frightened by our dependence upon foreign countries for strategic metals and minerals. We currently import more than 50% of our annual consumption of 20 critical minerals and metals. In many cases, the source of these minerals are countries with unstable governments or countries that we cannot call our allies. This leaves us in a potentially dangerous situation in the event that these supplies are cut off due to international instability. Our principal enemy, the Soviet Union, has not allowed itself to be put into this position and in fact, the Soviet Union is one of our principal suppliers of chromium, a critical element in the production of stainless steel that is very important to our military defense. The importation of mineral resources does not necessarily indicate a lack of mineral reserves in the United States nor a lack of capacity to produce these minerals. Our domestic production is controlled by the quality of ore, and the existing technologies for extracting the desired minerals from the ore. We must be improving our technology constantly in order to use our remaining ore reserves.

To advance mining technology which has remained fairly stagnant over recent years, our universities must train more mining engineers and mineral scientists. Currently, the demand for these engineers and scientists exceeds the supply to such a degree that the entire supply of graduates is being utilized in a production mode and research and technology development is not advancing. The market for graduates is so strong

that it is impossible to persuade students to remain in school to obtain advanced degrees. In fact, the demand is such that faculty are being hired away from the universities by industry. This problem is so severe that universities are threatened with an inability to provide quality education necessary to continue training scientists and engineers. Over the last 40 years, our universities have graduated an average of less than six Ph.D. mining engineers per year. These graduates are also not available to the universities as they are working in industry. The current source of mining engineering faculty are universities in foreign countries. The American trained mining engineering faculty have typically been faculty members since the mid-1950's. These faculty will soon be retiring, leaving a gaping hole in the faculty ranks in terms of experience and research ability.

A third glaring need in the mining and mineral industry is that of basic research. A focussed program of basic research in the area of mining and mineral resources is critical to the long-term economic stability in national security of the country. Currently, basic mining research is practically non-existent in industry, agencies, and universities. Universities provide a logical place for this type of research and the established Mineral Institute program offers an ideal structure in which to implement a basic research program. Technologies must be developed to utilize the raw materials available in our country and we must be striving to regain world leadership in these technology fields.

Through the establishment of the Mining and Mineral Resources Research Institute program, an infrastructure has been developed that is beginning to address the research and training needs for the mineral industry that will protect the security of our country. A broad range of capabilities and approaches is developing across the country and is presently returning training and research dividends on the limited amount of funds that have been invested in the program. However, the nature of the problem in terms of its complexity and critical importance not only warrants re-establishment of the program, but a considerable increase in funding to meet this need. These are the facts that must be considered in an assessment of the current Mineral Institute program and plans for its future. Therefore, it is recommended that funding for the Mining and Mineral Resources Research Institute program be increased to the authorized FY 1982 level of \$31 million.

Association of Mineral Institute Directors¹ Position Paper:
Mining and Mineral Resources Research Institute Program

THE PROGRAM

Under title III of Public Law 95-87, the Surface Mining Control and Reclamation Act of 1977, Congress provided for the establishment of Mining and Mineral Resources Research Institutes at qualified public universities in the United States. The purpose of the Institutes was described by Congress in the following manner:

"It shall be the duty of each such institute to plan and conduct and/or arrange for a component or components of the college or university with which it is affiliated to conduct competent research, investigations, demonstrations, and experiments of either a basic or practical nature, or both, in relation to mining and mineral resources and to provide for the training of mineral engineers and scientists through such research, investigations, demonstrations, experiments, and training may include, without being limited to; exploration; extraction; processing; and development; production of mineral resources; mining and mineral technology; supply and demand for minerals; conservation and best use of available supplies of minerals; the economic, legal, social, engineering, recreational, biological, geographic, ecological, and other aspects of mining, mineral resources, and mineral reclamation, having due regard to the interrelation on the natural environment, the varying conditions and needs of the respective States, and to mining and mineral resources research projects being conducted by agencies of the Federal and State governments, and other institutes."

This mandate is broad and provides for the universities selected the opportunity to meet this obligation with their best commitment of resources and personnel.

At the present time, thirty-one universities in thirty-one states have been designated as mineral institutes, Table 1. Within each state, the mineral institute was established at the university best suited to address the mandate of the law. In most cases, this is in the mining or mineral resources program, whichever is appropriate for that university. For example, in the University of Kentucky it resides in the Institute of Mineral Research and at Iowa State University in the Energy and Mineral Resources Research Institute.

Congress has provided funding for the institutes in two sections of the Act; Section 301 of Title III provides funds for the allotment program, and Section 302 funds the scholarship/fellowship program and the research grants program. Program management is through the Technical Services and Research Directorate of the Office of Surface Mining, U. S. Department of Interior.

¹The Association of Mineral Institute Directors is comprised of the directors of the thirty-one institutes that are funded under the Mineral Institute program.

The Allotment Program

During FY 1980 OSM awarded \$110,000 to each of the institutes as an allotment grant. Together with matching funds from their State, each has used this Federal assistance to enhance and improve their scientific facilities, research, or educational programs. More diverse courses and training in mining and mineral resources are now available at these schools due to this unique program. Each institute develops a plan within the framework of the MMRR program to utilize its allotment to best fulfill its particular needs. Some institutes used their allotments to acquire scientific and teaching equipment, to add faculty, to apply administrative support for the program, and to fund "seed" research projects. In all cases, the institutes were required to provide \$110,000 in state matching funds to supplement the institute allotment.

The Scholarship Fellowship Program

Scholarship and fellowship program funds are available to each state mineral institute. These funds have increased training opportunities for students in such fields as mineral resources and mining engineering. Initial grant agreements were signed with each institute providing \$160,000 to each institute for a period of three years.

The number of students receiving fellowships and scholarships varies from institute to institute based on the mix of undergraduate scholarships and graduate research fellowships awarded. Scholarship awards encourage undergraduate students to continue their studies in mining and mineral resource fields and fellowships support graduate students in their training as mining engineers and mineral scientists.

The Research Grant Program

The research grant program called for in the Act provided research grant awards by OSM for the first time in FY 1979. These grants are funding the tools used by mineral institute-trained scientists in developing future mining and mineral technology. In FY 1979, a total of \$2.73 million, and in FY 1980, \$5.48 million was awarded to the mineral institutes in the form of research grants. This research is being conducted in seven topical areas; mining including exploration, mineral processing including ceramics, extractive metallurgy, petroleum and natural gas engineering, mineral economics, environmental research related to mining, and legal/ social aspects related to mining. Commitments to continuing research projects in FY 1981 total \$4.22 million.

THE MISSION

It was clear in the development of the program that a need existed in mining and mineral resources university programs to strengthen them and bring mineral education and research to a level similar to the

agricultural programs in the United States. With the establishment of the MMRRRI program, the universities could now address the importance of minerals to the United States as stated by the Congress in the Mining and Mineral Policy Act of 1970, which stated that

" . . . it is the continuing policy of the Federal Government in the national interest to foster and encourage . . . (1) the development of economically sound and stable domestic mining, minerals, metal and mineral reclamation industries, (2) the orderly and economic development of domestic mineral resources, reserves, and reclamation of metals and minerals to help assure satisfaction of industrial, security and environmental needs, (3) mining, mineral and metallurgical research, including the use and recycling of scrap to promote the wise and efficient use of our natural and reclaimable mineral resources, and (4) the study and development of methods of the disposal, control, and reclamation of mineral waste products, and the reclamation of mined land, so as to lessen any adverse impact of mineral extraction and processing upon the physical environment that may result from mining or mineral activities . . . "

Critical to the implementation of this policy is the training of scientists and engineers to staff industry, governmental agencies and universities where mineral research is performed and mineral policy is developed to insure a healthy mining and mineral industry. The broad areas of mineral exploration, extraction, preparation, utilization, reclamation and the disposal of mineral waste products are all well suited for the university research and education programs. Traditional programs are being expanded and new multidisciplinary programs are emerging to address the problems of the future. Through this program, the United States can take advantage of the research potential of the universities and, at the same time, train the scientists and engineers for the future.

The mineral institutes as created form an important part of the government's attempt to maximize the mineral wealth of the nation. They serve as the bridge between government and industry, and provide the specially trained individuals for the mineral programs of government and industry. Although our nation contains a vast wealth of mineral resources, we are threatened by our dependence upon foreign sources for many minerals and metals critical to our national defense. Table 2 shows that we currently import more than 50% of our annual consumption of twenty minerals and metals. In many cases, the source of these minerals are countries with unstable governments or countries that we cannot call our allies. This puts us in a potentially dangerous situation as we remember our painful petroleum experiences with OPEC during the past decade. It is also important to realize that the Soviet Union has not allowed itself to fall into this position.

The importation of mineral resources does not necessarily indicate a lack of mineral resources in the U. S. nor our capacity to produce certain minerals. However, imports are a measure of our inability to compete with the prices of world supply. Domestic production of mineral reserves is controlled by the quality of ore, and the level of current

technology. The rich and easily produced minerals have been found. We must improve our technology constantly in order to use the low value ores. Even those are becoming more difficult to find and produce. This is understandable in the free consumer-based economy in which we live. However, the international power strategy of political manipulation of mineral supplies is so basic to our economic foundations and to our national security that we must watch and understand the roles assumed by other nations. The lesson of the 1973 oil embargo must not be forgotten and that lesson must be applied to our mineral industry today.

We must intensify our efforts to develop substitutes for imported oil from coal, oil shale and tar sands. These technologies have not advanced significantly in recent years. The same efforts must be made in addressing the strategic mineral issues of the country. These difficult problems are being faced by the State Mining and Mineral Resources Research Institutes in their research and the training of mineral engineers and scientists for the orderly exploration, extraction and utilization of our mineral resources.

THE ACCOMPLISHMENTS

The Mineral Institute program is in its third year and an example of the accomplishments of the program is given in Table 3 which indicates the area and number of students supported through the program. Concurrent with this student support are research projects representing a similarly broad range of mineral research needs of the states and the country. Appendix A contains abstracts of significant achievements of some of the mineral institutes supported through the Mineral Institute program.

THE NEED

The MMRI program was authorized to be funded as shown in the upper portion of Table 4. Actual funding has occurred as shown in the lower part of that table. There is a large discrepancy between authorization and funding which is uncommon for a program of this importance. The level of support for mineral research and training remains disproportionately low when compared to other programs of similar importance to the national economy defense and well being of the population.

The demand for mineral scientists and engineers is ever increasing and in some disciplines is not being met. In fact, demand is such that faculty are being hired away from the universities. This is severe and help is needed to make a university position more attractive so that key faculty members are not lost to industry. Increased research funding can be a way to keep these faculty on the campus while meeting the technology needs of the discipline.

With the impending loss of the Domestic Mining Fellowship Program, a substitute must be found for the support of high quality students in mineral resources fields. This can be accomplished in one of two ways:

1. an independent program similar to the domestic mining fellowship program but housed in a different agency, or 2. increased funding to the MMRI program with the stipulation that these increased funds go to the fellowship scholarship and post doctoral program. Either of the options above would work, however, option two would prove more expedient by putting the program under an existing management system resulting in better management and administrative economies.

A focused program of basic research in the area of mining and mineral resources is critical to the long-term economic stability and national security of the country. Currently, basic research in mining and mineral resources is practically non-existent in industry, very limited to non-existent in government, and very limited in the universities. Universities provide the logical place for this type of research and the established Mineral Institute program offers an ideal structure through which to implement a basic research program. Therefore, it is recommended that the funding for the Mining and Mineral Resources Research Institute Program be increased to the authorized FY 1972 level of \$31 million.

SUMMARY

Through the establishment of the Mining and Mineral Resources Research Institute program, an infrastructure has been developed that is beginning to address the research and training needs for the mineral industry of the country. A broad range of capabilities and approaches is targeting these needs. This developed infrastructure, as demonstrated above, is already returning dividends on the funds that have been invested in the program. However, the nature of the problem in terms of its complexity and critical importance to the security of the United States warrants not only maintenance of the program, but a considerable increase in funding to meet the need. These are the facts that must be considered in assessment of the current program and plans for the future of the MMRI program.

* NOT ONE OF THE ABOVE - MINERAL RESOURCES
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Table 1. Thirty-one Mineral Institutes.

<u>State</u>	<u>Mineral Institute</u>
Alabama	University of Alabama, Tuscaloosa
Alaska	University of Alaska, Fairbanks
Arizona	University of Arizona, Tucson
California	University of California, Berkeley
Colorado	Colorado School of Mines, Golden
Georgia	Georgia Institute of Technology, Atlanta
Idaho	University of Idaho, Moscow
Illinois	Southern Illinois University, Carbondale
Indiana	Purdue University, Lafayette
Iowa	Iowa State University, Ames
Kentucky	University of Kentucky, Lexington
Louisiana	Louisiana State University, Baton Rouge
Massachusetts	Massachusetts Institute of Technology, Cambridge
Michigan	Michigan Technological University, Houghton
Minnesota	University of Minnesota, Minneapolis
Mississippi	University of Mississippi, University
Missouri	University of Missouri, Rolla
Montana	Montana College of Mineral Science and Technology, Butte
Nevada	University of Nevada, Reno
New Mexico	New Mexico Institute of Mining and Technology, Socorro
North Dakota	University of North Dakota, Grand Forks
Ohio	Ohio State University, State College
Oklahoma	University of Oklahoma, Norman
Pennsylvania	Pennsylvania State University, State College
South Dakota	South Dakota School of Mines and Technology, Rapid City
Texas	University of Texas, Austin
Utah	University of Utah, Salt Lake City
Virginia	Virginia Polytechnic Institute, Blacksburg
Washington	University of Washington, Seattle
West Virginia	West Virginia University, Morgantown
Wyoming	University of Wyoming, Laramie

The demand for mineral scientists and engineers is ever increasing and in some disciplines is not being met. In fact, it is such that faculty are being hired away from the universities. This is a serious problem and it is needed to make a university position more attractive so that key faculty members are not lost to industry. Increased research funding can be a way to keep these faculty on the campus while meeting the technology needs of the discipline.

With the impending loss of the Dwight D. Eisenhower Fellowship Program, a substitute must be found for the support of high quality students in mineral resources fields. This can be accomplished in one of two ways:

Table 2. U. S. Net Import Reliance of Selected Minerals and Metals as a Percent of Consumption in 1978.



Table 3. Mineral Institute Program Student Support.

Degree Fields	Academic Levels		
	Undergraduate No. of Recipients	Graduate No. of Recipients	Post-Doctoral No. of Recipients
Mining Engineering	68	30	3
Extractive Metallurgy	34	20	4
Ceramic (Process) Eng.	14	4	1
Mineral Processing	15	12	3
Petroleum Eng.	60	5	
Mineral Economics	1	15	1
Fuel Science	5	7	1
Geological Engineering	34	15	1
Geological Disciplines	19	18	1
Environmental Engineering	10		
Reclamation	4	7	
Environmental Disciplines	8	5	
Chemical Disciplines	3	4	
Mineral Sciences	15		
Mineral Law Research		2	
Agricultural Disciplines	7	6	
TOTAL:	297	150	15
GRAND TOTAL: 462 Scholarships and Fellowships			

TABLE 4

Authorized by Title III PL 95-87

	78	79	80	81	82	83	84
Sec. 301 Allotment	\$200 K/Inst.	\$300 K/Inst.	\$400 K/Inst.	\$400 K/Inst.	\$400 K/Inst.	\$400 K/Inst.	\$400 K/Inst.
Sec. 302 Research and Fellowships and Admin.	\$15M	\$17M	\$19M	\$21M	\$23M	\$25M	\$27M
	\$19M *	\$23M	\$27M	\$29M	\$31M	\$33M	\$35M

Appropriated by Title III PL 95-85

	78	79	80	81
Sec. 301 Allotment	\$110 K/Inst.	\$110 K/Inst.	\$110 K/Inst.	\$110 K/Inst.
Sec. 302 Research and Fellowships and Admin.	\$3.2M	\$3.4M	\$6.59M	\$6.13M
	\$5.7M **	\$5.8M ***	\$10.0M	\$9.54M

* Assume 31 Institutes

** 22 Institutes

*** 31 Institutes

APPENDIX

Alaska:

The MMRRI at the University of Alaska has combined research with the training of students by having them work on thesis or research projects with fellowship support.

Alaska's coal resources estimated at one-third of those of the Nation and in view of the increasing emphasis on utilizing more coal, it is important that more knowledge of Alaska's coal be obtained and hence much of the Institute's research has been on coal.

Alaska's mineral development is in an early stage and innovative studies of major structural features on satellite imagery were conducted toward future production of minerals for the Nation's supply.

Louisiana:

Located in the center of oil and gas production and processing, Louisiana State University has been a major contributor to the education of engineers and scientists for these mineral resources over the past six decades. These are times when mineral industry salaries for B.S. engineering graduates are so high that graduate work is hardly even considered. However, funding of the Louisiana Mining and Mineral Resources Research Institute has provided the necessary increment to attract excellent students for mineral resources graduate studies and research. Advanced degree graduates are required to staff the mineral industries research and development laboratories to continue the flow of new and improved processes to maintain a viable industry.

Utah:

While funding at the University of Utah has not been large, still it has given us a tremendous amount of flexibility and has allowed us to do things that are important to the state and to the nation. It has provided funds with which we have been able to support mining, metallurgical and geological engineers. This is imperative in maintenance of a research program today. It has provided us with two technicians where before we had none, though the need was great. It has provided for significant purchases and has allowed us to initiate important research in the minerals area. I would urge that you would give the program serious consideration.

West Virginia:

The West Virginia University MMRRI has caused the development of new research capability on the environmental effects of mining in the West Virginia and Appalachian Region. A dramatically new method for

analyzing the predicting problems with mine subsidence and slope stability has been developed. A comprehensive computer modeling capability has been developed for hydrology problems for surface and deep mine applications. New techniques for preventing the production acidic drainage from reclaimed surface mines has been put into use.

Minnesota:

A new division of PROCESS TECHNOLOGY, including a new plasma laboratory, has been established and a new undergraduate B.Met.E. program developed. In MINING TECHNOLOGY a computer graphics facility has been supported and applications included in undergraduate and graduate courses. A new master's program in computer applications in rock mechanics is also being developed.

Nine postgraduate and four postdoctoral fellows are being funded with interests ranging from tunneling technology to plasma processing.

The MINERAL PROCESSING division has obtained significant results in research into utilization of tailings from the proposed development of the copper-nickel ores of northern Minnesota.

Washington:

For the past year, efforts of the Mineral Institute at the University of Washington were concentrated on mini-research "seed" projects. The purpose of this is to provide limited support for faculty in order that they may prepare and submit research proposals with the dual objective of ultimately carrying out research investigations directed towards mineral resources and supporting graduate students. Five such projects were funded, two have been submitted as formal proposals and we are pleased to report that one of these has already been funded. Professor David Lynch of extractive metallurgy has just been awarded a 4-year grant for \$170,000 by the U.S. Bureau of Mines.

Virginia:

An image analyzer has been developed by Professors J. R. Craig, R. M. Haralick and R. H. Yoon for the computer analysis of ore samples. It consists of a Leitz microscope, a Vidicon T.V. camera, a color T.V. monitor, and a VAX computer with one megabyte of memory and 900 megabytes of mass storage. This equipment takes digital pictures and uses them to determine the ore texture and its relationship with the liberation characteristics of minerals during grinding. It is also being used for the computer analyses of industrial grinding and flotation circuits by determining the degree of liberation and the recovery of free and locked particles.

Montana:

The Montana Institute, through its Small Mines Program, has prepared a Handbook of Mineral Processing for Small Mine Operators. This handbook will be published during 1981 and will be available from the Institute or the Montana Bureau of Mines & Geology. It will fill a considerable need for the typical small operator who must often these days undertake some mineral preparation work on the run-of-mine ore in order to have a salable product. Frequently, the small operator will not be able to secure professional advice and this booklet is intended to meet the needs of such operators. It is in no way intended to be a text on mineral processing methods. Hopefully, this handbook will make a contribution to the production of domestic minerals.

Other activities of the Montana Institute have been largely directed at improvements in the enrollment and quality of the research and education program at Montana College of Mineral Science and Technology.

Ohio:

One particular project stands out above all the rest and that is a project by one graduate student who is working in mineral processing. That student found a new liquid which breaks down coal. Industry has spent tens of millions of dollars since the 1960's looking at methods to break down coal; solvents under high pressures and temperatures, etc. This discovery at Ohio State University cost the government approximately \$8,000. With this process, coal will break down ten times faster than with any other known solvent. This same program is engaged in research on a new solvent which may result in a forty-times-faster rate of comminution than industry has been able to develop.

Oklahoma:

Trifluoroacetic, trifluoromethanesulfonic, and difluorophosphoric acids have been shown to be effective to comminuting bituminous coal. They readily react at atmospheric pressure as pure materials or as equal volume solutions with water. Trifluoroacetic acid reduces organic and inorganic sulfur and ash content of coal. Experiments are underway to determine the pressure and temperature where less concentrated aqueous solutions are effective as mining agents. Nonfluorinated analogs of these compounds are being examined for effectiveness as pressures and temperatures representative of bottom hole conditions. Model compounds have been used to predict the action of trifluoroacetic acid upon the functionality of the coal.

Illinois:

A recovery process to reclaim and clean fine coal from slurry ponds has been developed. This process can successfully remove clay, shale, most of the sulfate, and some pyrites in the slurry materials. The end product is either oil agglomerates or pellets of high quality, which

have a heating value between 11,500 to 12,500 BTU per pound. The waste streams of the process have been evaluated. The process water can be reused after an effective treatment, and the solid waste can be removed as inert material. The environmental problems are under control.

A mathematical model of the economic/environmental aspects of the process has been developed. For modeling purposes, the overall process is divided into five major processing steps: dry screening, wash, wet screen, agglomeration, and pelletization. Annualized capital, material, energy, labor and overhead costs, and total costs are predicted as a function of production rate and other operating variables, slurry characteristics and product quality requirements. Transportation and reclamation costs are also recognized.

Missouri:

Although all State Mine Institute support has been extremely important to the successful fulfillment of the mission of the University of Missouri - Rolla School of Mines and Metallurgy, support through the allotment grant has led directly to the training of a Ph.D. candidate in Geological Engineering who subsequently filled a critically needed faculty position. In 1978, the first year of the program, a portion of the allotment grant was made available for a pilot research study on use of digital image processing in evaluating mined land. Results of this study led to a research proposal submitted through the Institute for development of a digital data base from which coal mine subsidence might be predicted. A two-year grant was funded in October 1979. A Ph.D. student was named as co-investigator and successfully completed a Ph.D. dissertation during the first year of the two-year project. He was able to account for 95 percent of known subsidence in the study area with a natural resource digital base predicting model. He was appointed Assistant Professor of Geological Engineering in the fall of 1980 thus filling a critically needed permanent position. He is continuing to refine the subsidence model and will test its accuracy on another site during this year.

In this particular case, the Institute program provided for a pilot study which led to a funded research project. The project to date had yielded a geological subsidence prediction model which appears to be very accurate. In addition, a former earth science teacher was afforded the opportunity to obtain a Ph.D. in Geological Engineering. He now fills a position in a department which has had difficulty in finding qualified applicants for teaching positions.

California:

As a central part of its role for training and research, the California Institute of Mining and Mineral Resources objectives have been to provide a central focus for augmenting and coordinating the diverse but interrelated mining and mineral resources programs at Berkeley. Training and research programs of the Institute have been oriented towards the development of new technology needed to solve future mineral resources problems in three main areas: the exploration for mineral resources, the mining and extraction of mineral and energy resources, and the processing of mineral raw materials.

New Mexico:

The Mineral Institute has become an essential part of the educational system of New Mexico Institute of Mining and Technology during its three year existence. It has already provided financial support for 31 ALLOTMENT projects, i.e., for purchasing capital equipment and initiating new research; 20 undergraduate SCHOLARSHIPS; 24 graduate and two postdoctoral FELLOWSHIPS. The INDIVIDUAL RESEARCH GRANTS together with the above research support have considerably strengthened the quality of the mineral oriented educational training and research at New Mexico Tech. Through these activities, better educated and trained engineers leave our Institute, and they will contribute to the maintenance of the nation's progress in mineral industries. This way, the Mineral Institute fulfills the primary objective of the 1977 Surface Mining Act.

Kentucky:

The reclamation research program in the Department of Agricultural Engineering at the University of Kentucky is directed towards solving the major problems facing the surface mining industry in this state. Major accomplishments of the program include the development of DEPOSITS, a computer program for designing sediment ponds; the development of SEDIMOT, a computer model for estimating storm sediment yield and sediment size distribution; the development of procedures (nomographs) for designing vegetative filters for non-structural control of erosion and sediment; and the study of enhanced flocculation in sediment ponds using chemical water quality standards. DEPOSITS, for example, is widely used throughout the country for designing sediment ponds because it is simple to use and because it yields accurate results.

Ongoing research of major importance to the surface mining industry includes: (1) extension of the data base for estimating erosion to surface mined lands (presently estimates are based on data from agricultural lands); (2) examine the interaction of slope and slope-length on the erosion process; (3) obtain empirical estimates of dead storage and short circuiting in sediment ponds for different pond geometries and baffle systems using similarity analysis; and (4) mathematically modeling the dynamics of small ponds. These research projects are user-oriented and will significantly improve the surface mining industry's ability to control erosion and sedimentation.

Iowa:

At Iowa State University, the Mineral Research Institute's interdisciplinary mineral research program is yielding promising prospects: fugitive dust transport at surface mine sites is being mathematically simulated to provide first estimates of dust loading in the mine atmosphere and particulate deposition in the mine environment caused by various dust source strengths and idealized mine configurations. Changes in solution concentration during in-situ dissolution of uranium ore is being modeled to predict conditions which result in precipitation of uranium during dissolution. Ground water studies conducted at abandoned and reclaimed mine sites are providing comparison hydrologic data for both orphan spoil and terraced farmland.

Mining and Mineral Resources Research
Institute Program

SUMMARY

The Reagan Administration along with the numerous agencies that administer the governmental programs of our country, have undertaken an important and difficult task of reducing government spending and balancing the national budget. This is a task that certainly requires considerable diligence and effort in the assessment of the merits and needs of current programs. To assist you in this assessment, it is important that you understand the critical importance of maintaining the Mineral Institute program within the Department of Interior, Office of Surface Mining, because currently the President's budget seeks no funds for FY 82 to support this program.

The Mineral Institute program is now completing its third year of activity. This activity has seen mineral institutes established in 31 universities in 31 states that are now beginning to significantly address the mining and mineral resources training and research needs of the country. With the small amount of funds currently appropriated to date, they are now addressing some of the most serious national concerns that our country now faces. A description of the Mineral Institute program that now exists is attached to this statement as a reference document, however, critical concerns being addressed by the program follows:

The United States currently faces an alarming shortage of minerals and metals critical to the economic activity and national defense of our country. If you are concerned with the reliance of our country on the importation of oil from the Middle East, you will be frightened by our dependence upon foreign countries for strategic metals and minerals. We currently import more than 50% of our annual consumption of 20 critical minerals and metals. In many cases, the source of these minerals are countries with unstable governments or countries that we cannot call our allies. This leaves us in a potentially dangerous situation in the event that these supplies are cut off due to international instability. Our principal enemy, the Soviet Union, has not allowed itself to be put into this position and in fact, the Soviet Union is one of our principal suppliers of chromium, a critical element in the production of stainless steel that is very important to our military defense. The importation of mineral resources does not necessarily indicate a lack of mineral reserves in the United States nor a lack of capacity to produce these minerals. Our domestic production is controlled by the quality of ore, and the existing technologies for extracting the desired minerals from the ore. We must be improving our technology constantly in order to use our remaining ore reserves.

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THE PROGRAM

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"It shall be the duty of each such institute to plan and conduct and/or arrange for a component or components of the college or university with which it is affiliated to conduct competent research, investigations, demonstrations, and experiments of either a basic or practical nature, or both, in relation to mining and mineral resources and to provide for the training of mineral engineers and scientists through such research, investigations, demonstrations, experiments, and training may include, without being limited to; exploration; extraction; processing; and development; production of mineral resources; mining and mineral technology; supply and demand for minerals; conservation and best use of available supplies of minerals; the economic, legal, social, engineering, recreational, biological, geographic, ecological, and other aspects of mining, mineral resources, and mineral reclamation, having due regard to the interrelation on the natural environment, the varying conditions and needs of the respective States, and to mining and mineral resources research projects being conducted by agencies of the Federal and State governments, and other institutes."

This mandate is broad and provides for the universities selected the opportunity to meet this obligation with their best commitment of resources and personnel.

At the present time, thirty-one universities in thirty-one states have been designated as mineral institutes, Table 1. Within each state, the mineral institute was established at the university best suited to address the mandate of the law. In most cases, this is in the mining or mineral resources program, whichever is appropriate for that university. For example, in the University of Kentucky it resides in the Institute of Mineral Research and at Iowa State University in the Energy and Mineral Resources Research Institute.

Congress has provided funding for the institutes in two sections of the Act; Section 301 of Title III provides funds for the allotment program, and Section 302 funds the scholarship/fellowship program and the research grants program. Program management is through the Technical Services and Research Directorate of the Office of Surface Mining, U. S. Department of Interior.

¹The Association of Mineral Institute Directors is comprised of the directors of the thirty-one institutes that are funded under the Mineral Institute program.

The Allotment Program

During FY 1980 OSM awarded \$110,000 to each of the institutes as an allotment grant. Together with matching funds from their State, each has used this Federal assistance to enhance and improve their scientific facilities, research, or educational programs. More diverse courses and training in mining and mineral resources are now available at these schools due to this unique program. Each institute develops a plan within the framework of the MMRRRI program to utilize its allotment to best fulfill its particular needs. Some institutes used their allotments to acquire scientific and teaching equipment, to add faculty, to apply administrative support for the program, and to fund "seed" research projects. In all cases, the institutes were required to provide \$110,000 in state matching funds to supplement the institute allotment.

The Scholarship Fellowship Program

Scholarship and fellowship program funds are available to each state mineral institute. These funds have increased training opportunities for students in such fields as mineral resources and mining engineering. Initial grant agreements were signed with each institute providing \$160,000 to each institute for a period of three years.

The number of students receiving fellowships and scholarships varies from institute to institute based on the mix of undergraduate scholarships and graduate research fellowships awarded. Scholarship awards encourage undergraduate students to continue their studies in mining and mineral resource fields and fellowships support graduate students in their training as mining engineers and mineral scientists.

The Research Grant Program

The research grant program called for in the Act provided research grant awards by OSM for the first time in FY 1979. These grants are funding the tools used by mineral institute-trained scientists in developing future mining and mineral technology. In FY 1979, a total of \$2.73 million, and in FY 1980, \$5.48 million was awarded to the mineral institutes in the form of research grants. This research is being conducted in seven topical areas; mining including exploration, mineral processing including ceramics, extractive metallurgy, petroleum and natural gas engineering, mineral economics, environmental research related to mining, and legal/ social aspects related to mining. Commitments to continuing research projects in FY 1981 total \$4.22 million.

THE MISSION

It was clear in the development of the program that a need existed in mining and mineral resources university programs to strengthen them and bring mineral education and research to a level similar to the

agricultural programs in the United States. With the establishment of the MMRI program, the universities could now address the importance of minerals to the United States as stated by the Congress in the Mining and Mineral Policy Act of 1970, which stated that

"... it is the continuing policy of the Federal Government in the national interest to foster and encourage . . . (1) the development of economically sound and stable domestic mining, minerals, metal and mineral reclamation industries, (2) the orderly and economic development of domestic mineral resources, reserves, and reclamation of metals and minerals to help assure satisfaction of industrial, security and environmental needs, (3) mining, mineral and metallurgical research, including the use and recycling of scrap to promote the wise and efficient use of our natural and reclaimable mineral resources, and (4) the study and development of methods of the disposal, control, and reclamation of mineral waste products, and the reclamation of mined land, so as to lessen any adverse impact of mineral extraction and processing upon the physical environment that may result from mining or mineral activities . . ."

Critical to the implementation of this policy is the training of scientists and engineers to staff industry, governmental agencies and universities where mineral research is performed and mineral policy is developed to insure a healthy mining and mineral industry. The broad areas of mineral exploration, extraction, preparation, utilization, reclamation and the disposal of mineral waste products are all well suited for the university research and education programs. Traditional programs are being expanded and new multidisciplinary programs are emerging to address the problems of the future. Through this program, the United States can take advantage of the research potential of the universities and, at the same time, train the scientists and engineers for the future.

The mineral institutes as created form an important part of the government's attempt to maximize the mineral wealth of the nation. They serve as the bridge between government and industry, and provide the specially trained individuals for the mineral programs of government and industry. Although our nation contains a vast wealth of mineral resources, we are threatened by our dependence upon foreign sources for many minerals and metals critical to our national defense. Table 2 shows that we currently import more than 50% of our annual consumption of twenty minerals and metals. In many cases, the source of these minerals are countries with unstable governments or countries that we cannot call our allies. This puts us in a potentially dangerous situation as we remember our painful petroleum experiences with OPEC during the past decade. It is also important to realize that the Soviet Union has not allowed itself to fall into this position.

The importation of mineral resources does not necessarily indicate a lack of mineral resources in the U. S. nor our capacity to produce certain minerals. However, imports are a measure of our inability to compete with the prices of world supply. Domestic production of mineral reserves is controlled by the quality of ore, and the level of current

technology. The rich and easily produced minerals have been found. We must improve our technology constantly in order to use the low value ores. Even those are becoming more difficult to find and produce. This is understandable in the free consumer-based economy in which we live. However, the international power strategy of political manipulation of mineral supplies is so basic to our economic foundations and to our national security that we must watch and understand the roles assumed by other nations. The lesson of the 1973 oil embargo must not be forgotten and that lesson must be applied to our mineral industry today.

We must intensify our efforts to develop substitutes for imported oil from coal, oil shale and tar sands. These technologies have not advanced significantly in recent years. The same efforts must be made in addressing the strategic mineral issues of the country. These difficult problems are being faced by the State Mining and Mineral Resources Research Institutes in their research and the training of mineral engineers and scientists for the orderly exploration, extraction and utilization of our mineral resources.

THE ACCOMPLISHMENTS

The Mineral Institute program is in its third year and an example of the accomplishments of the program is given in Table 3 which indicates the area and number of students supported through the program. Concurrent with this student support are research projects representing a similarly broad range of mineral research needs of the states and the country. Appendix A contains abstracts of significant achievements of some of the mineral institutes supported through the Mineral Institute program.

THE NEED

The MMRRRI program was authorized to be funded as shown in the upper portion of Table 4. Actual funding has occurred as shown in the lower part of that table. There is a large discrepancy between authorization and funding which is uncommon for a program of this importance. The level of support for mineral research and training remains disproportionately low when compared to other programs of similar importance to the national economy defense and well being of the population.

The demand for mineral scientists and engineers is ever increasing and in some disciplines is not being met. In fact, demand is such that faculty are being hired away from the universities. This is severe and help is needed to make a university position more attractive so that key faculty members are not lost to industry. Increased research funding can be a way to keep these faculty on the campus while meeting the technology needs of the discipline.

With the impending loss of the Domestic Mining Fellowship Program, a substitute must be found for the support of high quality students in mineral resources fields. This can be accomplished in one of two ways:

1. an independent program similar to the domestic mining fellowship program but housed in a different agency, or 2. increased funding to the MMRI program with the stipulation that these increased funds go to the fellowship scholarship and post doctoral program. Either of the options above would work, however, option two would prove more expedient by putting the program under an existing management system resulting in better management and administrative economies.

A focused program of basic research in the area of mining and mineral resources is critical to the long-term economic stability and national security of the country. Currently, basic research in mining and mineral resources is practically non-existent in industry, very limited to non-existent in government, and very limited in the universities. Universities provide the logical place for this type of research and the established Mineral Institute program offers an ideal structure through which to implement a basic research program. Therefore, it is recommended that the funding for the Mining and Mineral Resources Research Institute Program be increased to the authorized FY 1972 level of \$31 million.

SUMMARY

Through the establishment of the Mining and Mineral Resources Research Institute program, an infrastructure has been developed that is beginning to address the research and training needs for the mineral industry of the country. A broad range of capabilities and approaches is targeting these needs. This developed infrastructure, as demonstrated above, is already returning dividends on the funds that have been invested in the program. However, the nature of the problem in terms of its complexity and critical importance to the security of the United States warrants not only maintenance of the program, but a considerable increase in funding to meet the need. These are the facts that must be considered in assessment of the current program and plans for the future of the MMRI program.

Table 1. Thirty-one Mineral Institutes.

<u>State</u>	<u>Mineral Institute</u>
Alabama	University of Alabama, Tuscaloosa
Alaska	University of Alaska, Fairbanks
Arizona	University of Arizona, Tucson
California	University of California, Berkeley
Colorado	Colorado School of Mines, Golden
Georgia	Georgia Institute of Technology, Atlanta
Idaho	University of Idaho, Moscow
Illinois	Southern Illinois University, Carbondale
Indiana	Purdue University, Lafayette
Iowa	Iowa State University, Ames
Kentucky	University of Kentucky, Lexington
Louisiana	Louisiana State University, Baton Rouge
Massachusetts	Massachusetts Institute of Technology, Cambridge
Michigan	Michigan Technological University, Houghton
Minnesota	University of Minnesota, Minneapolis
Mississippi	University of Mississippi, University
Missouri	University of Missouri, Rolla
Montana	Montana College of Mineral Science and Technology, Butte
Nevada	University of Nevada, Reno
New Mexico	New Mexico Institute of Mining and Technology, Socorro
North Dakota	University of North Dakota, Grand Forks
Ohio	Ohio State University, State College
Oklahoma	University of Oklahoma, Norman
Pennsylvania	Pennsylvania State University, State College
South Dakota	South Dakota School of Mines and Technology, Rapid City
Texas	University of Texas, Austin
Utah	University of Utah, Salt Lake City
Virginia	Virginia Polytechnic Institute, Blacksburg
Washington	University of Washington, Seattle
West Virginia	West Virginia University, Morgantown
Wyoming	University of Wyoming, Laramie

Table 2. U. S. Net Import Reliance of Selected Minerals and Metals as a Percent of Consumption in 1978.



Table 3. Mineral Institute Program Student Support.

Degree Fields	Academic Levels		
	Undergraduate	Graduate	Post-Doctoral
	No. of Recipients	No. of Recipients	No. of Recipients
Mining Engineering	68	30	3
Extractive Metallurgy	34	20	4
Ceramic (Process) Eng.	14	4	1
Mineral Processing	15	12	3
Petroleum Eng.	60	5	
Mineral Economics	1	15	1
Fuel Science	5	7	1
Geological Engineering	34	15	1
Geological Disciplines	19	18	1
Environmental Engineering	10		
Reclamation	4	7	
Environmental Disciplines	8	5	
Chemical Disciplines	3	4	
Mineral Sciences	15		
Mineral Law Research		2	
Agricultural Disciplines	7	6	
TOTAL:	297	150	15

GRAND TOTAL: 462 Scholarships and Fellowships

TABLE 4

Authorized by Title III PL 95-87

	78	79	80	81	82	83	84
Sec. 301 Allotment	\$200 K/Inst.	\$300 K/Inst.	\$400 K/Inst.	\$400 K/Inst.	\$400 K/Inst.	\$400 K/Inst.	\$400 K/Inst.
Sec. 302 Research and Fellowships and Admin.	\$15M	\$17M	\$19M	\$21M	\$23M	\$25M	\$27M
	\$19M *	\$23M	\$27M	\$29M	\$31M	\$33M	\$35M

Appropriated by Title III PL 95-85

	78	79	80	81
Sec. 301 Allotment	\$110 K/Inst.	\$110 K/Inst.	\$110 K/Inst.	\$110 K/Inst.
Sec. 302 Research and Fellowships and Admin.	\$3.2M	\$3.4M	\$6.59M	\$6.13M
	\$5.7M **	\$5.8M ***	\$10.0M	\$9.54M

* Assume 31 Institutes

** 22 Institutes

*** 31 Institutes

APPENDIX

Alaska:

The MMRRRI at the University of Alaska has combined research with the training of students by having them work on thesis or research projects with fellowship support.

Alaska's coal resources estimated at one-third of those of the Nation and in view of the increasing emphasis on utilizing more coal, it is important that more knowledge of Alaska's coal be obtained and hence much of the Institute's research has been on coal.

Alaska's mineral development is in an early stage and innovative studies of major structural features on satellite imagery were conducted toward future production of minerals for the Nation's supply.

Louisiana:

Located in the center of oil and gas production and processing, Louisiana State University has been a major contributor to the education of engineers and scientists for these mineral resources over the past six decades. These are times when mineral industry salaries for B.S. engineering graduates are so high that graduate work is hardly even considered. However, funding of the Louisiana Mining and Mineral Resources Research Institute has provided the necessary increment to attract excellent students for mineral resources graduate studies and research. Advanced degree graduates are required to staff the mineral industries research and development laboratories to continue the flow of new and improved processes to maintain a viable industry.

Utah:

While funding at the University of Utah has not been large, still it has given us a tremendous amount of flexibility and has allowed us to do things that are important to the state and to the nation. It has provided funds with which we have been able to support mining, metallurgical and geological engineers. This is imperative in maintenance of a research program today. It has provided us with two technicians where before we had none, though the need was great. It has provided for significant purchases and has allowed us to initiate important research in the minerals area. I would urge that you would give the program serious consideration.

West Virginia:

The West Virginia University MMRRRI has caused the development of new research capability on the environmental effects of mining in the West Virginia and Appalachian Region. A dramatically new method for

analyzing the predicting problems with mine subsidence and slope stability has been developed. A comprehensive computer modeling capability has been developed for hydrology problems for surface and deep mine applications. New techniques for preventing the production acidic drainage from reclaimed surface mines has been put into use.

Minnesota:

A new division of PROCESS TECHNOLOGY, including a new plasma laboratory, has been established and a new undergraduate B.Met.E. program developed. In MINING TECHNOLOGY a computer graphics facility has been supported and applications included in undergraduate and graduate courses. A new master's program in computer applications in rock mechanics is also being developed.

Nine postgraduate and four postdoctoral fellows are being funded with interests ranging from tunneling technology to plasma processing.

The MINERAL PROCESSING division has obtained significant results in research into utilization of tailings from the proposed development of the copper-nickel ores of northern Minnesota.

Washington:

For the past year, efforts of the Mineral Institute at the University of Washington were concentrated on mini-research "seed" projects. The purpose of this is to provide limited support for faculty in order that they may prepare and submit research proposals with the dual objective of ultimately carrying out research investigations directed towards mineral resources and supporting graduate students. Five such projects were funded, two have been submitted as formal proposals and we are pleased to report that one of these has already been funded. Professor David Lynch of extractive metallurgy has just been awarded a 4-year grant for \$170,000 by the U.S. Bureau of Mines.

Virginia:

An image analyzer has been developed by Professors J. R. Craig, R. M. Haralick and R. H. Yoon for the computer analysis of ore samples. It consists of a Leitz microscope, a Vidicon T.V. camera, a color T.V. monitor, and a VAX computer with one megabyte of memory and 900 megabytes of mass storage. This equipment takes digital pictures and uses them to determine the ore texture and its relationship with the liberation characteristics of minerals during grinding. It is also being used for the computer analyses of industrial grinding and flotation circuits by determining the degree of liberation and the recovery of free and locked particles.

Montana:

The Montana Institute, through its Small Mines Program, has prepared a Handbook of Mineral Processing for Small Mine Operators. This handbook will be published during 1981 and will be available from the Institute or the Montana Bureau of Mines & Geology. It will fill a considerable need for the typical small operator who must often these days undertake some mineral preparation work on the run-of-mine ore in order to have a salable product. Frequently, the small operator will not be able to secure professional advice and this booklet is intended to meet the needs of such operators. It is in no way intended to be a text on mineral processing methods. Hopefully, this handbook will make a contribution to the production of domestic minerals.

Other activities of the Montana Institute have been largely directed at improvements in the enrollment and quality of the research and education program at Montana College of Mineral Science and Technology.

Ohio:

One particular project stands out above all the rest and that is a project by one graduate student who is working in mineral processing. That student found a new liquid which breaks down coal. Industry has spent tens of millions of dollars since the 1960's looking at methods to break down coal; solvents under high pressures and temperatures, etc. This discovery at Ohio State University cost the government approximately \$8,000. With this process, coal will break down ten times faster than with any other known solvent. This same program is engaged in research on a new solvent which may result in a forty-times-faster rate of comminution than industry has been able to develop.

Oklahoma:

Trifluoroacetic, trifluoromethanesulfonic, and difluorophosphoric acids have been shown to be effective to comminuting bituminous coal. They readily react at atmospheric pressure as pure materials or as equal volume solutions with water. Trifluoroacetic acid reduces organic and inorganic sulfur and ash content of coal. Experiments are underway to determine the pressure and temperature where less concentrated aqueous solutions are effective as mining agents. Nonfluorinated analogs of these compounds are being examined for effectiveness as pressures and temperatures representative of bottom hole conditions. Model compounds have been used to predict the action of trifluoroacetic acid upon the functionality of the coal.

Illinois:

A recovery process to reclaim and clean fine coal from slurry ponds has been developed. This process can successfully remove clay, shale, most of the sulfate, and some pyrites in the slurry materials. The end product is either oil agglomerates or pellets of high quality, which

have a heating value between 11,500 to 12,500 BTU per pound. The waste streams of the process have been evaluated. The process water can be reused after an effective treatment, and the solid waste can be removed as inert material. The environmental problems are under control.

A mathematical model of the economic/environmental aspects of the process has been developed. For modeling purposes, the overall process is divided into five major processing steps: dry screening, wash, wet screen, agglomeration, and pelletization. Annualized capital, material, energy, labor and overhead costs, and total costs are predicted as a function of production rate and other operating variables, slurry characteristics and product quality requirements. Transportation and reclamation costs are also recognized.

Missouri:

Although all State Mine Institute support has been extremely important to the successful fulfillment of the mission of the University of Missouri - Rolla School of Mines and Metallurgy, support through the allotment grant has led directly to the training of a Ph.D. candidate in Geological Engineering who subsequently filled a critically needed faculty position. In 1978, the first year of the program, a portion of the allotment grant was made available for a pilot research study on use of digital image processing in evaluating mined land. Results of this study led to a research proposal submitted through the Institute for development of a digital data base from which coal mine subsidence might be predicted. A two-year grant was funded in October 1979. A Ph.D. student was named as co-investigator and successfully completed a Ph.D. dissertation during the first year of the two-year project. He was able to account for 95 percent of known subsidence in the study area with a natural resource digital base predicting model. He was appointed Assistant Professor of Geological Engineering in the fall of 1980 thus filling a critically needed permanent position. He is continuing to refine the subsidence model and will test its accuracy on another site during this year.

In this particular case, the Institute program provided for a pilot study which led to a funded research project. The project to date had yielded a geological subsidence prediction model which appears to be very accurate. In addition, a former earth science teacher was afforded the opportunity to obtain a Ph.D. in Geological Engineering. He now fills a position in a department which has had difficulty in finding qualified applicants for teaching positions.

California:

As a central part of its role for training and research, the California Institute of Mining and Mineral Resources objectives have been to provide a central focus for augmenting and coordinating the diverse but interrelated mining and mineral resources programs at Berkeley. Training and research programs of the Institute have been oriented towards the development of new technology needed to solve future mineral resources problems in three main areas: the exploration for mineral resources, the mining and extraction of mineral and energy resources, and the processing of mineral raw materials.

New Mexico:

The Mineral Institute has become an essential part of the educational system of New Mexico Institute of Mining and Technology during its three year existence. It has already provided financial support for 31 ALLOTMENT projects, i.e., for purchasing capital equipment and initiating new research; 20 undergraduate SCHOLARSHIPS; 24 graduate and two postdoctoral FELLOWSHIPS. The INDIVIDUAL RESEARCH GRANTS together with the above research support have considerably strengthened the quality of the mineral oriented educational training and research at New Mexico Tech. Through these activities, better educated and trained engineers leave our Institute, and they will contribute to the maintenance of the nation's progress in mineral industries. This way, the Mineral Institute fulfills the primary objective of the 1977 Surface Mining Act.

Kentucky:

The reclamation research program in the Department of Agricultural Engineering at the University of Kentucky is directed towards solving the major problems facing the surface mining industry in this state. Major accomplishments of the program include the development of DEPOSITS, a computer program for designing sediment ponds; the development of SEDIMOT, a computer model for estimating storm sediment yield and sediment size distribution; the development of procedures (nomographs) for designing vegetative filters for non-structural control of erosion and sediment; and the study of enhanced flocculation in sediment ponds using chemical water quality standards. DEPOSITS, for example, is widely used throughout the country for designing sediment ponds because it is simple to use and because it yields accurate results.

Ongoing research of major importance to the surface mining industry includes: (1) extension of the data base for estimating erosion to surface mined lands (presently estimates are based on data from agricultural lands); (2) examine the interaction of slope and slope-length on the erosion process; (3) obtain empirical estimates of dead storage and short circuiting in sediment ponds for different pond geometries and baffle systems using similarity analysis; and (4) mathematically modeling the dynamics of small ponds. These research projects are user-oriented and will significantly improve the surface mining industry's ability to control erosion and sedimentation.

Iowa:

At Iowa State University, the Mineral Research Institute's interdisciplinary mineral research program is yielding promising prospects: fugitive dust transport at surface mine sites is being mathematically simulated to provide first estimates of dust loading in the mine atmosphere and particulate deposition in the mine environment caused by various dust source strengths and idealized mine configurations. Changes in solution concentration during in-situ dissolution of uranium ore is being modeled to predict conditions which result in precipitation of uranium during dissolution. Ground water studies conducted at abandoned and reclaimed mine sites are providing comparison hydrologic data for both orphan spoil and terraced farmland.

Mining and Mineral Resources Research
Institute Program

SUMMARY

The Reagan Administration along with the numerous agencies that administer the governmental programs of our country, have undertaken an important and difficult task of reducing government spending and balancing the national budget. This is a task that certainly requires considerable diligence and effort in the assessment of the merits and needs of current programs. To assist you in this assessment, it is important that you understand the critical importance of maintaining the Mineral Institute program within the Department of Interior, Office of Surface Mining, because currently the President's budget seeks no funds for FY 82 to support this program.

The Mineral Institute program is now completing its third year of activity. This activity has seen mineral institutes established in 31 universities in 31 states that are now beginning to significantly address the mining and mineral resources training and research needs of the country. With the small amount of funds currently appropriated to date, they are now addressing some of the most serious national concerns that our country now faces. A description of the Mineral Institute program that now exists is attached to this statement as a reference document, however, critical concerns being addressed by the program follows:

The United States currently faces an alarming shortage of minerals and metals critical to the economic activity and national defense of our country. If you are concerned with the reliance of our country on the importation of oil from the Middle East, you will be frightened by our dependence upon foreign countries for strategic metals and minerals. We currently import more than 50% of our annual consumption of 20 critical minerals and metals. In many cases, the source of these minerals are countries with unstable governments or countries that we cannot call our allies. This leaves us in a potentially dangerous situation in the event that these supplies are cut off due to international instability. Our principal enemy, the Soviet Union, has not allowed itself to be put into this position and in fact, the Soviet Union is one of our principal suppliers of chromium, a critical element in the production of stainless steel that is very important to our military defense. The importation of mineral resources does not necessarily indicate a lack of mineral reserves in the United States nor a lack of capacity to produce these minerals. Our domestic production is controlled by the quality of ore, and the existing technologies for extracting the desired minerals from the ore. We must be improving our technology constantly in order to use our remaining ore reserves.

To advance mining technology which has remained fairly stagnant over recent years, our universities must train more mining engineers and mineral scientists. Currently, the demand for these engineers and scientists exceeds the supply to such a degree that the entire supply of graduates is being utilized in a production mode and research and technology development is not advancing. The market for graduates is so strong

that it is impossible to persuade students to remain in school to obtain advanced degrees. In fact, the demand is such that faculty are being hired away from the universities by industry. This problem is so severe that universities are threatened with an inability to provide quality education necessary to continue training scientists and engineers. Over the last 40 years, our universities have graduated an average of less than six Ph.D. mining engineers per year. These graduates are also not available to the universities as they are working in industry. The current source of mining engineering faculty are universities in foreign countries. The American trained mining engineering faculty have typically been faculty members since the mid-1950's. These faculty will soon be retiring, leaving a gaping hole in the faculty ranks in terms of experience and research ability.

A third glaring need in the mining and mineral industry is that of basic research. A focussed program of basic research in the area of mining and mineral resources is critical to the long-term economic stability in national security of the country. Currently, basic mining research is practically non-existent in industry, agencies, and universities. Universities provide a logical place for this type of research and the established Mineral Institute program offers an ideal structure in which to implement a basic research program. Technologies must be developed to utilize the raw materials available in our country and we must be striving to regain world leadership in these technology fields.

Through the establishment of the Mining and Mineral Resources Research Institute program, an infrastructure has been developed that is beginning to address the research and training needs for the mineral industry that will protect the security of our country. A broad range of capabilities and approaches is developing across the country and is presently returning training and research dividends on the limited amount of funds that have been invested in the program. However, the nature of the problem in terms of its complexity and critical importance not only warrants re-establishment of the program, but a considerable increase in funding to meet this need. These are the facts that must be considered in an assessment of the current Mineral Institute program and plans for its future. Therefore, it is recommended that funding for the Mining and Mineral Resources Research Institute program be increased to the authorized FY 1982 level of \$31 million.

Association of Mineral Institute Directors¹ Position Paper:
Mining and Mineral Resources Research Institute Program

THE PROGRAM

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This mandate is broad and provides for the universities selected the opportunity to meet this obligation with their best commitment of resources and personnel.

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It was clear in the development of the program that a need existed in mining and mineral resources university programs to strengthen them and bring mineral education and research to a level similar to the

agricultural programs in the United States. With the establishment of the MMRRRI program, the universities could now address the importance of minerals to the United States as stated by the Congress in the Mining and Mineral Policy Act of 1970, which stated that

"... it is the continuing policy of the Federal Government in the national interest to foster and encourage . . . (1) the development of economically sound and stable domestic mining, minerals, metal and mineral reclamation industries, (2) the orderly and economic development of domestic mineral resources, reserves, and reclamation of metals and minerals to help assure satisfaction of industrial, security and environmental needs, (3) mining, mineral and metallurgical research, including the use and recycling of scrap to promote the wise and efficient use of our natural and reclaimable mineral resources, and (4) the study and development of methods of the disposal, control, and reclamation of mineral waste products, and the reclamation of mined land, so as to lessen any adverse impact of mineral extraction and processing upon the physical environment that may result from mining or mineral activities . . ."

Critical to the implementation of this policy is the training of scientists and engineers to staff industry, governmental agencies and universities where mineral research is performed and mineral policy is developed to insure a healthy mining and mineral industry. The broad areas of mineral exploration, extraction, preparation, utilization, reclamation and the disposal of mineral waste products are all well suited for the university research and education programs. Traditional programs are being expanded and new multidisciplinary programs are emerging to address the problems of the future. Through this program, the United States can take advantage of the research potential of the universities and, at the same time, train the scientists and engineers for the future.

The mineral institutes as created form an important part of the government's attempt to maximize the mineral wealth of the nation. They serve as the bridge between government and industry, and provide the specially trained individuals for the mineral programs of government and industry. Although our nation contains a vast wealth of mineral resources, we are threatened by our dependence upon foreign sources for many minerals and metals critical to our national defense. Table 2 shows that we currently import more than 50% of our annual consumption of twenty minerals and metals. In many cases, the source of these minerals are countries with unstable governments or countries that we cannot call our allies. This puts us in a potentially dangerous situation as we remember our painful petroleum experiences with OPEC during the past decade. It is also important to realize that the Soviet Union has not allowed itself to fall into this position.

The importation of mineral resources does not necessarily indicate a lack of mineral resources in the U. S. nor our capacity to produce certain minerals. However, imports are a measure of our inability to compete with the prices of world supply. Domestic production of mineral reserves is controlled by the quality of ore, and the level of current

technology. The rich and easily produced minerals have been found. We must improve our technology constantly in order to use the low value ores. Even those are becoming more difficult to find and produce. This is understandable in the free consumer-based economy in which we live. However, the international power strategy of political manipulation of mineral supplies is so basic to our economic foundations and to our national security that we must watch and understand the roles assumed by other nations. The lesson of the 1973 oil embargo must not be forgotten and that lesson must be applied to our mineral industry today.

We must intensify our efforts to develop substitutes for imported oil from coal, oil shale and tar sands. These technologies have not advanced significantly in recent years. The same efforts must be made in addressing the strategic mineral issues of the country. These difficult problems are being faced by the State Mining and Mineral Resources Research Institutes in their research and the training of mineral engineers and scientists for the orderly exploration, extraction and utilization of our mineral resources.

THE ACCOMPLISHMENTS

The Mineral Institute program is in its third year and an example of the accomplishments of the program is given in Table 3 which indicates the area and number of students supported through the program. Concurrent with this student support are research projects representing a similarly broad range of mineral research needs of the states and the country. Appendix A contains abstracts of significant achievements of some of the mineral institutes supported through the Mineral Institute program.

THE NEED

The MMRRRI program was authorized to be funded as shown in the upper portion of Table 4. Actual funding has occurred as shown in the lower part of that table. There is a large discrepancy between authorization and funding which is uncommon for a program of this importance. The level of support for mineral research and training remains disproportionately low when compared to other programs of similar importance to the national economy defense and well being of the population.

The demand for mineral scientists and engineers is ever increasing and in some disciplines is not being met. In fact, demand is such that faculty are being hired away from the universities. This is severe and help is needed to make a university position more attractive so that key faculty members are not lost to industry. Increased research funding can be a way to keep these faculty on the campus while meeting the technology needs of the discipline.

With the impending loss of the Domestic Mining Fellowship Program, a substitute must be found for the support of high quality students in mineral resources fields. This can be accomplished in one of two ways:

1. an independent program similar to the domestic mining fellowship program but housed in a different agency, or 2. increased funding to the MMRI program with the stipulation that these increased funds go to the fellowship scholarship and post doctoral program. Either of the options above would work, however, option two would prove more expedient by putting the program under an existing management system resulting in better management and administrative economies.

A focused program of basic research in the area of mining and mineral resources is critical to the long-term economic stability and national security of the country. Currently, basic research in mining and mineral resources is practically non-existent in industry, very limited to non-existent in government, and very limited in the universities. Universities provide the logical place for this type of research and the established Mineral Institute program offers an ideal structure through which to implement a basic research program. Therefore, it is recommended that the funding for the Mining and Mineral Resources Research Institute Program be increased to the authorized FY 1972 level of \$31 million.

SUMMARY

Through the establishment of the Mining and Mineral Resources Research Institute program, an infrastructure has been developed that is beginning to address the research and training needs for the mineral industry of the country. A broad range of capabilities and approaches is targeting these needs. This developed infrastructure, as demonstrated above, is already returning dividends on the funds that have been invested in the program. However, the nature of the problem in terms of its complexity and critical importance to the security of the United States warrants not only maintenance of the program, but a considerable increase in funding to meet the need. These are the facts that must be considered in assessment of the current program and plans for the future of the MMRI program.

Table 1. Thirty-one Mineral Institutes.

<u>State</u>	<u>Mineral Institute</u>
Alabama	University of Alabama, Tuscaloosa
Alaska	University of Alaska, Fairbanks
Arizona	University of Arizona, Tucson
California	University of California, Berkeley
Colorado	Colorado School of Mines, Golden
Georgia	Georgia Institute of Technology, Atlanta
Idaho	University of Idaho, Moscow
Illinois	Southern Illinois University, Carbondale
Indiana	Purdue University, Lafayette
Iowa	Iowa State University, Ames
Kentucky	University of Kentucky, Lexington
Louisiana	Louisiana State University, Baton Rouge
Massachusetts	Massachusetts Institute of Technology, Cambridge
Michigan	Michigan Technological University, Houghton
Minnesota	University of Minnesota, Minneapolis
Mississippi	University of Mississippi, University
Missouri	University of Missouri, Rolla
Montana	Montana College of Mineral Science and Technology, Butte
Nevada	University of Nevada, Reno
New Mexico	New Mexico Institute of Mining and Technology, Socorro
North Dakota	University of North Dakota, Grand Forks
Ohio	Ohio State University, State College
Oklahoma	University of Oklahoma, Norman
Pennsylvania	Pennsylvania State University, State College
South Dakota	South Dakota School of Mines and Technology, Rapid City
Texas	University of Texas, Austin
Utah	University of Utah, Salt Lake City
Virginia	Virginia Polytechnic Institute, Blacksburg
Washington	University of Washington, Seattle
West Virginia	West Virginia University, Morgantown
Wyoming	University of Wyoming, Laramie

Table 2. U. S. Net Import Reliance of Selected Minerals and Metals as a Percent of Consumption in 1978.



Table 3. Mineral Institute Program Student Support.

Degree Fields	Academic Levels		
	Undergraduate No. of Recipients	Graduate No. of Recipients	Post-Doctoral No. of Recipients
Mining Engineering	68	30	3
Extractive Metallurgy	34	20	4
Ceramic (Process) Eng.	14	4	1
Mineral Processing	15	12	3
Petroleum Eng.	60	5	
Mineral Economics	1	15	1
Fuel Science	5	7	1
Geological Engineering	34	15	1
Geological Disciplines	19	18	1
Environmental Engineering	10		
Reclamation	4	7	
Environmental Disciplines	8	5	
Chemical Disciplines	3	4	
Mineral Sciences	15		
Mineral Law Research		2	
Agricultural Disciplines	7	6	
TOTAL:	297	150	15
GRAND TOTAL:	462 Scholarships and Fellowships		

TABLE 4

Authorized by Title III PL 95-87

	78	79	80	81	82	83	84
Sec. 301 Allotment	\$200 K/Inst.	\$300 K/Inst.	\$400 K/Inst.	\$400 K/Inst.	\$400 K/Inst.	\$400 K/Inst.	\$400 K/Inst.
Sec. 302 Research and Fellowships and Admin.	\$15M	\$17M	\$19M	\$21M	\$23M	\$25M	\$27M
	\$19M *	\$23M	\$27M	\$29M	\$31M	\$33M	\$35M

Appropriated by Title III PL 95-85

	78	79	80	81
Sec. 301 Allotment	\$110 K/Inst.	\$110 K/Inst.	\$110 K/Inst.	\$110 K/Inst.
Sec. 302 Research and Fellowships and Admin.	\$3.2M	\$3.4M	\$6.59M	\$6.13M
	\$5.7M **	\$5.8M ***	\$10.0M	\$9.54M

* Assume 31 Institutes

** 22 Institutes

*** 31 Institutes

APPENDIX

Alaska:

The MMRRRI at the University of Alaska has combined research with the training of students by having them work on thesis or research projects with fellowship support.

Alaska's coal resources estimated at one-third of those of the Nation and in view of the increasing emphasis on utilizing more coal, it is important that more knowledge of Alaska's coal be obtained and hence much of the Institute's research has been on coal.

Alaska's mineral development is in an early stage and innovative studies of major structural features on satellite imagery were conducted toward future production of minerals for the Nation's supply.

Louisiana:

Located in the center of oil and gas production and processing, Louisiana State University has been a major contributor to the education of engineers and scientists for these mineral resources over the past six decades. These are times when mineral industry salaries for B.S. engineering graduates are so high that graduate work is hardly even considered. However, funding of the Louisiana Mining and Mineral Resources Research Institute has provided the necessary increment to attract excellent students for mineral resources graduate studies and research. Advanced degree graduates are required to staff the mineral industries research and development laboratories to continue the flow of new and improved processes to maintain a viable industry.

Utah:

While funding at the University of Utah has not been large, still it has given us a tremendous amount of flexibility and has allowed us to do things that are important to the state and to the nation. It has provided funds with which we have been able to support mining, metallurgical and geological engineers. This is imperative in maintenance of a research program today. It has provided us with two technicians where before we had none, though the need was great. It has provided for significant purchases and has allowed us to initiate important research in the minerals area. I would urge that you would give the program serious consideration.

West Virginia:

The West Virginia University MMRRRI has caused the development of new research capability on the environmental effects of mining in the West Virginia and Appalachian Region. A dramatically new method for

analyzing the predicting problems with mine subsidence and slope stability has been developed. A comprehensive computer modeling capability has been developed for hydrology problems for surface and deep mine applications. New techniques for preventing the production acidic drainage from reclaimed surface mines has been put into use.

Minnesota:

A new division of PROCESS TECHNOLOGY, including a new plasma laboratory, has been established and a new undergraduate B.Met.E. program developed. In MINING TECHNOLOGY a computer graphics facility has been supported and applications included in undergraduate and graduate courses. A new master's program in computer applications in rock mechanics is also being developed.

Nine postgraduate and four postdoctoral fellows are being funded with interests ranging from tunneling technology to plasma processing.

The MINERAL PROCESSING division has obtained significant results in research into utilization of tailings from the proposed development of the copper-nickel ores of northern Minnesota.

Washington:

For the past year, efforts of the Mineral Institute at the University of Washington were concentrated on mini-research "seed" projects. The purpose of this is to provide limited support for faculty in order that they may prepare and submit research proposals with the dual objective of ultimately carrying out research investigations directed towards mineral resources and supporting graduate students. Five such projects were funded, two have been submitted as formal proposals and we are pleased to report that one of these has already been funded. Professor David Lynch of extractive metallurgy has just been awarded a 4-year grant for \$170,000 by the U.S. Bureau of Mines.

Virginia:

An image analyzer has been developed by Professors J. R. Craig, R. M. Haralick and R. H. Yoon for the computer analysis of ore samples. It consists of a Leitz microscope, a Vidicon T.V. camera, a color T.V. monitor, and a VAX computer with one megabyte of memory and 900 megabytes of mass storage. This equipment takes digital pictures and uses them to determine the ore texture and its relationship with the liberation characteristics of minerals during grinding. It is also being used for the computer analyses of industrial grinding and flotation circuits by determining the degree of liberation and the recovery of free and locked particles.

Montana:

The Montana Institute, through its Small Mines Program, has prepared a Handbook of Mineral Processing for Small Mine Operators. This handbook will be published during 1981 and will be available from the Institute or the Montana Bureau of Mines & Geology. It will fill a considerable need for the typical small operator who must often these days undertake some mineral preparation work on the run-of-mine ore in order to have a salable product. Frequently, the small operator will not be able to secure professional advice and this booklet is intended to meet the needs of such operators. It is in no way intended to be a text on mineral processing methods. Hopefully, this handbook will make a contribution to the production of domestic minerals.

Other activities of the Montana Institute have been largely directed at improvements in the enrollment and quality of the research and education program at Montana College of Mineral Science and Technology.

Ohio:

One particular project stands out above all the rest and that is a project by one graduate student who is working in mineral processing. That student found a new liquid which breaks down coal. Industry has spent tens of millions of dollars since the 1960's looking at methods to break down coal; solvents under high pressures and temperatures, etc. This discovery at Ohio State University cost the government approximately \$8,000. With this process, coal will break down ten times faster than with any other known solvent. This same program is engaged in research on a new solvent which may result in a forty-times-faster rate of comminution than industry has been able to develop.

Oklahoma:

Trifluoroacetic, trifluoromethanesulfonic, and difluorophosphoric acids have been shown to be effective to comminuting bituminous coal. They readily react at atmospheric pressure as pure materials or as equal volume solutions with water. Trifluoroacetic acid reduces organic and inorganic sulfur and ash content of coal. Experiments are underway to determine the pressure and temperature where less concentrated aqueous solutions are effective as mining agents. Nonfluorinated analogs of these compounds are being examined for effectiveness as pressures and temperatures representative of bottom hole conditions. Model compounds have been used to predict the action of trifluoroacetic acid upon the functionality of the coal.

Illinois:

A recovery process to reclaim and clean fine coal from slurry ponds has been developed. This process can successfully remove clay, shale, most of the sulfate, and some pyrites in the slurry materials. The end product is either oil agglomerates or pellets of high quality, which

have a heating value between 11,500 to 12,500 BTU per pound. The waste streams of the process have been evaluated. The process water can be reused after an effective treatment, and the solid waste can be removed as inert material. The environmental problems are under control.

A mathematical model of the economic/environmental aspects of the process has been developed. For modeling purposes, the overall process is divided into five major processing steps: dry screening, wash, wet screen, agglomeration, and pelletization. Annualized capital, material, energy, labor and overhead costs, and total costs are predicted as a function of production rate and other operating variables, slurry characteristics and product quality requirements. Transportation and reclamation costs are also recognized.

Missouri:

Although all State Mine Institute support has been extremely important to the successful fulfillment of the mission of the University of Missouri - Rolla School of Mines and Metallurgy, support through the allotment grant has led directly to the training of a Ph.D. candidate in Geological Engineering who subsequently filled a critically needed faculty position. In 1978, the first year of the program, a portion of the allotment grant was made available for a pilot research study on use of digital image processing in evaluating mined land. Results of this study led to a research proposal submitted through the Institute for development of a digital data base from which coal mine subsidence might be predicted. A two-year grant was funded in October 1979. A Ph.D. student was named as co-investigator and successfully completed a Ph.D. dissertation during the first year of the two-year project. He was able to account for 95 percent of known subsidence in the study area with a natural resource digital base predicting model. He was appointed Assistant Professor of Geological Engineering in the fall of 1980 thus filling a critically needed permanent position. He is continuing to refine the subsidence model and will test its accuracy on another site during this year.

In this particular case, the Institute program provided for a pilot study which led to a funded research project. The project to date had yielded a geological subsidence prediction model which appears to be very accurate. In addition, a former earth science teacher was afforded the opportunity to obtain a Ph.D. in Geological Engineering. He now fills a position in a department which has had difficulty in finding qualified applicants for teaching positions.

California:

As a central part of its role for training and research, the California Institute of Mining and Mineral Resources objectives have been to provide a central focus for augmenting and coordinating the diverse but interrelated mining and mineral resources programs at Berkeley. Training and research programs of the Institute have been oriented towards the development of new technology needed to solve future mineral resources problems in three main areas: the exploration for mineral resources, the mining and extraction of mineral and energy resources, and the processing of mineral raw materials.

New Mexico:

The Mineral Institute has become an essential part of the educational system of New Mexico Institute of Mining and Technology during its three year existence. It has already provided financial support for 31 ALLOTMENT projects, i.e., for purchasing capital equipment and initiating new research; 20 undergraduate SCHOLARSHIPS; 24 graduate and two postdoctoral FELLOWSHIPS. The INDIVIDUAL RESEARCH GRANTS together with the above research support have considerably strengthened the quality of the mineral oriented educational training and research at New Mexico Tech. Through these activities, better educated and trained engineers leave our Institute, and they will contribute to the maintenance of the nation's progress in mineral industries. This way, the Mineral Institute fulfills the primary objective of the 1977 Surface Mining Act.

Kentucky:

The reclamation research program in the Department of Agricultural Engineering at the University of Kentucky is directed towards solving the major problems facing the surface mining industry in this state. Major accomplishments of the program include the development of DEPOSITS, a computer program for designing sediment ponds; the development of SEDIMOT, a computer model for estimating storm sediment yield and sediment size distribution; the development of procedures (nomographs) for designing vegetative filters for non-structural control of erosion and sediment; and the study of enhanced flocculation in sediment ponds using chemical water quality standards. DEPOSITS, for example, is widely used throughout the country for designing sediment ponds because it is simple to use and because it yields accurate results.

Ongoing research of major importance to the surface mining industry includes: (1) extension of the data base for estimating erosion to surface mined lands (presently estimates are based on data from agricultural lands); (2) examine the interaction of slope and slope-length on the erosion process; (3) obtain empirical estimates of dead storage and short circuiting in sediment ponds for different pond geometries and baffle systems using similarity analysis; and (4) mathematically modeling the dynamics of small ponds. These research projects are user-oriented and will significantly improve the surface mining industry's ability to control erosion and sedimentation.

Iowa:

At Iowa State University, the Mineral Research Institute's interdisciplinary mineral research program is yielding promising prospects: fugitive dust transport at surface mine sites is being mathematically simulated to provide first estimates of dust loading in the mine atmosphere and particulate deposition in the mine environment caused by various dust source strengths and idealized mine configurations. Changes in solution concentration during in-situ dissolution of uranium ore is being modeled to predict conditions which result in precipitation of uranium during dissolution. Ground water studies conducted at abandoned and reclaimed mine sites are providing comparison hydrologic data for both orphan spoil and terraced farmland.

WRITTEN TESTIMONY OF
JAMES M. ROBISON
PRESIDENT, SOUTHERN INDIANA SHALE OIL CO., INC.
FOR THE INTERIOR SUBCOMMITTEE
APPROPRIATIONS COMMITTEE
U.S. HOUSE OF REPRESENTATIVES
APRIL 2, 1981

Southern Indiana Shale Oil Co., Inc., known as SISO, submits the following information as evidence to be included within the record in this committee's present hearings, the same as though we had presented this material as oral testimony as a part of the subcommittee's hearing procedure.

SISO was one of 79 recipients of grants selected from over 1100 applicants in the second round of feasibility study and cooperative agreement proposals from the Department of Energy. That these 79 were awarded grants from so many applicants, after several layers of competitive review by the Department of Energy, is I believe compelling evidence of their viability. My knowledge, of course, is most extensive as it relates to the SISO proposal, and my comments will emphasize the merits of our effort.

Our grant is in the nature of a research and development feasibility study grant and no part of it is to be used for construction or as a cooperative loan agreement. It is, however, by the terms presented to us by the DOE a repayable grant. When we go into commercial production, we will repay it. That grant is now included within a portion of the funds which we have been informed is subject to the rescission order relating to said second round grants.

It is our understanding that the administration and other interested public officials have expressed the intent not to do away with government funding of energy research and development. Our feasibility study is in this research and development category.

The Administration's stated position, before this and other subcommittees, on the rescission of such feasibility grants as that won by SISO is that these planning and study activities should more properly compete for financing in the private market along with other energy projects. If research and development funds were actually readily available from private financial sources, the logic and merits of the rescission action might be better understood. Such, however, is not the case. Until the research and development work is complete so that a company can advance beyond that state of its development, there simply is not any readily available capital from private sources. Feasibility studies do not represent a good investment to the private capital market. Investors want to see the feasibility studies first. How then can this important work be accomplished if the government will not make these repayable grants to companies whose intended work is found to have high potential in terms of the nation's energy needs.

Being a small business comprised of Southern Indiana businessmen intent on producing shale oil at the earliest possible date, we want to make known that we sincerely believe further delaying or preventing the development of this readily available oil source is a critical error for the following specific reasons:

1. A 50,000 barrel-per-day plant can be in full production within four years, and significant quantities can be produced within two years.

2. On the other hand, a large oil company, that has attempted to enter into negotiations to purchase SISO oil shale leases, has indicated to other potential lease sellers that it would not intend to start shale oil production for ten years.

3. The DOD and DOE have gone on record in support of producing shale oil as a mobility fuel particularly well suited to the nation's defense requirements. Tests indicate that oil produced from the eastern Devonian shales when burned as jet fuel produces a very low infra-red reading that is more difficult to detect by radar than is jet fuel produced from petroleum and western shale. Also, the crude produced from these eastern shales is lightweight and will pour at 40 degrees below zero.

4. In addition, the oil from the Indiana shale is very low in pollutants and does not present the substantial environmental problems of processing as do the shales found in the western states.

5. The thickness of the eastern shales in the SISO plant area exceed 100 feet and are capable of producing 20 gallons per ton of top quality crude with a potential per-acre yield of 134,000 barrels.

Economy in this feasibility studies area is at the expense of national security and ignores the cause of the energy price and supply problem, eliminates an important cure and claims to do it in the best interest of the public. It seems we are killing the good with the bad. One is reminded of the answer Constantine made while ordering the entire population of a city to be destroyed. He was asked why the good were to be destroyed with the bad. His answer was to kill them all and let the devil claim his own. Hopefully, the present Administration is not taking this position with regard to matters of national security and energy policy.

We would respectfully ask that serious consideration be given to retaining those grants contained within the second round of alternative fuel projects of the DOE which relate to feasibility studies. They consist of approximately \$90 million of the \$300 million total. In a December 11, 1980, press release DOE projected that these feasibility studies could result in replacing 568,581 barrels of crude petroleum equivalent a day. By contrast, the same press release only attributed a saving of 169,722 barrels of crude petroleum equivalent to the \$180 million in cooperative agreements awarded in the second round.

Financing for these feasibility studies is not available in the marketplace, at least those that have been granted to small businesses such as Southern Indiana Shale Oil Co., Inc., who do not have the financial and credit resources of the large oil companies at their disposal.

MONDAY, MARCH 23, 1981.

OFFICE OF WATER RESEARCH AND TECHNOLOGY

WITNESSES

TOBIAS ANTHONY, DIRECTOR OF WASHINGTON AFFAIRS, BI-PHASE DIVISION, RESEARCH-COTTRELL

H. K. BABOYIAN, VICE PRESIDENT, UOP, INC.

HAROLD DAVIS, PRESIDENT, CONCENTRATION SPECIALISTS

DONALD W. DOUGLAS, JR., CHAIRMAN OF THE BOARD, BI-PHASE ENERGY SYSTEMS

ARTHUR L. GOLDSTEIN, PRESIDENT, IONICS, INC.

ROY E. LARSON, VICE PRESIDENT, FILMTEC CORPORATION

HAROLD K. LONSDALE, PRESIDENT, BEND RESEARCH, INC.

ARTHUR S. OBERMAYER, PRESIDENT, MOLECULON RESEARCH CORPORATION

HUGO H. SEPHTON, ENVIROTECH CORPORATION

Mr. YATES. Mr. Obermayer, do you want to come up to the table? I suppose all of you could come up to the table, really, rather than taking you one by one, unless you prefer to come up one by one.

We may have some questions later on for the record for which we will request your answers.

OPENING REMARKS

Mr. YATES. I would like to have an informal discussion with all of you, if that is satisfactory, because, I do not know whether you all have different problems or you all have the same problem.

What the committee is interested in is trying to find some way of deciding whether the policy of the administration in cutting back on OWRT and establishing in the future a Water Resources Council is in the best interest of the country.

I have the idea that we have a real water problem and a problem that is going to get progressively worse. Our energy needs continue to grow. Well, that is secondary. Our people's needs for water continue to grow and the cities' needs are growing.

First of all, I want to thank all of you for coming. I appreciate very much your willingness to come here and take the time to go over this problem with us because as I indicated, it is a very important problem.

I respect the position that you people have in dealing with the problem. I should give you, by way of background, the fact that we are told that insofar as a distilling method is concerned there is no need for any further Government funding because it is all in your hands; it is all in the hands of the water companies. All you need is customers. You can supply the commercial development that anybody needs as far as the conversion of brackish water to good water is concerned. However, then we come to the question of seawater. Now that is the essence of the testimony that we have. I thought you should have that background.

What is the best way to handle this? Suppose we start off by asking Mr. Obermayer. As I indicated, your statement is part of the record. Mr. Obermayer, what do you think we ought to do? Tell me what it is you want to tell me. Maybe I ought to put it that way.

Mr. OBERMAYER. My reason for being here is really twofold: one as President of a company that has been doing work with the Office of Water Research and Technology, and second, really another role that I have.

I have testified over many years before many other congressional committees, never on an area that affected my own company personally, but related primarily to innovation in technology, to jobs, our economy, national priorities and options for the country. This is really the first time that I have been asked to go beyond some of the broad policy issues and address a specific problem which is facing my own company.

Now because my company is affected, you may feel that my testimony is biased but I can assure you that I would be here anyhow because of these broad problems which are at least as important. Really, this planned dissolution runs counter to all of the policies I have been supporting for years.

Mr. YATES. Well, does that mean that the administration is right or you are right, if they run contrary to what your opinion has been in the past?

Mr. OBERMAYER. Who is to say who is right? Time will tell, and I am afraid that the effect on our economy is what bothers me most in the broader context. Over the years there has been many, many studies that have shown that really the majority of the major innovations and new technologies in the United States come from small companies and individual inventors. These are just the kinds of people who are affected most.

Mr. YATES. Tell me how you will be affected by this.

Mr. OBERMAYER. Our business, a significant portion of our business—has come from the Office of Water Research and Technology, and we feel it is an ideal agency to deal with.

It is an ideal agency because they are not an agency that defines a specific requirement to within a gnat's eyebrow and says, This is what we need. "Who can make it for us?" Rather, they are an agency that has encouraged in their procurement process the inflow of innovative approaches from outside. The primary producer of these new ideas, new approaches, is small business.

My concern really is that when the administration says that the whole area of water resource use is mature enough and well enough developed that it does not need any further Government support, what it is really saying is that there are a lot of big companies out there that are fat and happy that want to stay that way, and they do not want any competition. The new technologies will come from the kind of people that OWRT has been supporting.

They have been looking for new ideas and sure, they will compete with the large companies but I would rather see American small companies grow to be large and compete with other Ameri-

can large companies than to find the Japanese coming in and representing the new competition to the large companies.

We have seen this over and over again. I think good examples—

Mr. YATES. What will the competition be? You are talking about the place of small business as opposed to big business and I appreciate that. The question in my mind is, is big business in a position to move in the development or the commercialization of dealing with the problems of obtaining potable water?

Mr. OBERMAYER. Big business currently has products on the market, products which they can sell.

Mr. YATES. Will that deal with the problem?

Mr. OBERMAYER. No, it will not deal with the problem but it is the best state of the art that is available today.

Mr. YATES. How good is the state of that art? That is really my question.

Mr. OBERMAYER. Not good enough.

Mr. YATES. Now do all of you agree with this?

[There was a chorus of affirmative replies.]

Mr. YATES. The state of the art is not good enough. Does that mean then the committee can draw the conclusion from that that the postulate of the administration is correct that business is now ready, apart from Government research, apart from Government funding, to move into the production or providing the services that will make the conversion of brackish water to potable water possible?

One gentleman shakes his head. Do all of you shake your heads? For the record, does each of you want to say something in response to that question? Gentlemen, will you identify yourselves for the record, please?

Mr. GOLDSTEIN. My name is Arthur Goldstein. I am the President of Ionics in Watertown, Massachusetts, and we have been in the desalination business for 30 years. One question that comes up right off the top of your head is how come we are not a billion dollar corporation?

Part of the answer comes from the fact that the desalination business is not the kind of business which has boomed in the last 30 years, and I would like to explain some of the background of why this is.

Mr. YATES. I was just going to interrupt you. Would you boom if Government withdraws from this and permits you to boom?

Mr. GOLDSTEIN. Just the opposite.

I am going to explain something that very few people understand but if I can take a few minutes I would like to develop this point because I think it does not come through clearly.

Mr. YATES. You may indeed. Please do.

Mr. GOLDSTEIN. I think there are two questions. I have been before committees like this before and we have won some and we have lost some. Mainly we have lost and I think we are going to lose again unless this committee does something about it.

Mr. GOLDSTEIN. I think there are basically two questions that have been put on the table, and they are statements, they come out in the form of statements. The first is that the basic R&D for water

desalting has been accomplished and there is therefore no need for Government support. That is statement number one.

Statement number two is that the U.S. desalting industry is economically viable and can afford and will undertake to do any R&D that may be required. Those are the two points that I think you are hitting.

Mr. YATES. Yes.

Mr. GOLDSTEIN. I think those points could be knocked down very easily, and I will just outline my position and then let others come in.

First of all on the point that the basic R&D has been accomplished and therefore there is no further need, I think that judgment can be refuted by some very obvious facts, first of all with respect to brackish water R&D which is tougher to hit than seawater.

Mr. YATES. Tougher than seawater?

Mr. GOLDSTEIN. Tougher to knock down the arguments on than seawater because brackish water is supposedly more commercial.

Mr. YATES. Right.

Mr. GOLDSTEIN. I will do that one first.

With respect to brackish water, the most significant information which refutes the position of those that would stop this comes from the Department of Interior itself. I do not know whether you are aware of it but there is a plant that has been supposedly in the final stages of construction for some time called the Yuma, Arizona water desalting plant.

On March 4th there was a press release entitled, "Yuma Desalting Plant Program Delayed," which was put out by the Department of Interior and is attached, incidentally, to the back of my statement. In that release, Acting Commissioner Cliff Barrett announced that the proof testing for the 100-million-gallon-a-day Yuma plant—supposed to be the largest of its kind in the world—to desalt the Colorado River for Mexico under a treaty would be discontinued.

It would be discontinued basically because the membranes which are the heart of the desalting process—I do not know how much of this you are familiar with.

Mr. YATES. I am familiar with some of it.

Mr. GOLDSTEIN. Okay. The membranes did not work. There was a real shootout at the time this whole thing came up 4 years ago with all of the technology processes coming in, and many companies made statements about what technology was going to work and what was not.

There was testimony before the GAO, and basically the GAO ruled in that case, "Let's go ahead with the technology that the Government chose." Many of the older companies in the business, including my own, testified that those membranes would not work. Anyway, they did not and now we may be \$400 million later down the road.

Therefore, I say that it confounds reason that the administration can on the one hand propose to cancel R&D programs by claiming that R&D on water processes is complete, and on the other hand discontinue temporarily and perhaps permanently its major high-technology construction program, the Yuma project, because it

cannot complete the required proof testing—which is part of the game—without more R&D work. Clearly research can never be over until the proof testing is completed.

Contrary to the administration's position, the Yuma experience clearly indicates that the desalting industry has not completed the R&D or reached the point of proven commercial technology that the administration believed when it proposed to cancel future R&D. The Yuma experience also indicates that had R&D funds not been severely cut in the past, the Government probably could have avoided what now could possibly turn out to be a \$400 million mistake.

If nothing more, properly run, low-cost R&D programs—and we are not talking about much money here at all—can serve as an insurance policy to reduce the possibility of high-cost technological errors. All of the Government's annually funded desalination R&D programs together represent less than 5 percent of the cost of the Yuma project.

Now I have some more on that but I am going to skip it because I want to get into the second point, which is that the U.S. desalting industry is economically viable and can afford and will undertake to do any R&D which may be required. The basis for this judgment is unclear to me.

What is clear is that there is no booming U.S. desalting industry, and we will let others confirm this as they see fit. What is clear to me is that unless the desalting industry can see a booming business around the corner, so to speak, it will not do anything other than what I would call short-term R&D, that is, R&D that has very short time span consequences.

Mr. YATES. Do you draw a distinction between desalting and seawater?

Mr. GOLDSTEIN. No.

Mr. YATES. OK.

Mr. GOLDSTEIN. The previous part of my argument went to seawater desalination. I did not mention that because if anything, seawater is ever further behind brackish water.

Mr. YATES. Further in the future. Yes, that is right.

Mr. GOLDSTEIN. That argument is in my paper.

Mr. YATES. OK.

Mr. GOLDSTEIN. What I am saying is that they will not do anything other than short-term R&D without business around the corner. You are talking about the viability issue.

Since the booming business has not arrived, it is a fair assumption that in the absence of Government support most long-term R&D, A, will either not be done at all or B, will be done very slowly over a long period of time.

Now I do not think we are here to debate the issue of whether it will not be done at all because I think the basic answer to the question is, it is going to get done. I think the real information comes from, how does this country get hurt if we do the R&D slowly over a much longer period of time rather than have Government support and do it quickly?

Mr. YATES. However, you say it is going to be done.

Mr. GOLDSTEIN. I would like to address that.

Mr. YATES. Go ahead.

Mr. GOLDSTEIN. I think doing water R&D slowly—which is my premise of what will happen if this support is cut—is harmful because it exposes our Nation to the prospect of not being ready when fresh water alternatives are required. That is easy to say but it is very real.

Two, if water supplies are destroyed or deteriorated by accident or drought, we cannot say at that point in time, "Let's get some fresh water R&D and we will take it from there," because it is going to be too late.

Three, the nature of water R&D is laborious and the testing already takes several years before the success can be known. Desalination and water processing research is not like that for an electronics device—this is a key point—where one virtually knows the success of the R&D as soon as you plug the device in.

In the water field, a processing device may work perfectly on the first day but after exposure to thousands or millions of gallons of water, may start to fail in subtle and not so subtle ways. Proof testing of water systems takes several years, as the Government people at Yuma, Arizona have found out.

Four, only very large companies can afford R&D which is strung out over many years. This echoes Art's point.

Mr. YATES. May I interrupt and ask a question from time to time?

Mr. GOLDSTEIN. Please.

MEMBRANE TESTING EQUIPMENT

Mr. YATES. Do any of the large companies have their own membrane testing equipment? I assume the small companies do not have them.

Mr. GOLDSTEIN. Not of the type that is at Wrightsville Beach or at Roswell, New Mexico.

Mr. YATES. Is that type necessary for the testing?

Mr. GOLDSTEIN. I believe it is of extreme importance to that.

Mr. YATES. Can the large companies get that kind of equipment?

Mr. GOLDSTEIN. Yes, they can but I do not think they are going to do it because of the argument I gave you before: Their ROI calculation, return on investment, will say that R&D of this type is not going to pay out for many years. Unless you are a duPont or a Dow and you can afford to say that you will sink X millions of dollars into this and wait a long time. And to their credit, some of them are doing this. You are not going to stay around to see the best ideas.

I agree with Arthur Obermayer's position that a lot of the really innovative ideas are not coming from the large companies. Yes, if the country waits indefinitely I think it is fair to say that duPont and Dow will be around and that ideas that take a long time for them to fund over many years will be proceeding at some pace when we have a water crisis.

Whether it will be at the right point is the key question I am addressing myself to, and to my basic point is that this country cannot afford to wait for them to do it at their speed. Therefore, I say the innovative and entrepreneurial ideas of the smaller organizations will not survive in a climate of slow R&D because those companies cannot wait around.

On the other hand, I think perhaps the judgment that the necessary water R&D will get done by industry is based on the assumption that our Nation can afford to allow the business opportunity in the desalination market to control the decision as to what water R&D, if any, will get done. If so, that is very unfortunate because that rationale ignores the point that fresh water is very different from an ordinary business product.

Water is different because it is necessary for life. Fresh water is not a discretionary product, such as an electronic product or process machinery where it is actually efficient and socially safe to allow the market system to decide the appropriate R&D level. We cannot do that with water. That is the basic point.

If the R&D for water were to be delayed until the market system would signal for more R&D, as the administration suggests, our country would be taking a very large and very unnecessary risk with respect to the future availability of a precious resource, one that is even more important than oil or new energy sources.

I can make a number of other points but I probably have taken more time than I should in developing this.

Mr. YATES. Well, that is all right.

Mr. GOLDSTEIN. I have a number of other points that support this.

Mr. YATES. I will read your statement, yes.

Mr. GOLDSTEIN. That is the essence of what I am saying, that we are taking unnecessary risks to human health. I would point out one other thing, that in addition to that risk such a policy would also increase our Nation's risk of losing our technological position in desalination by slowing down R&D, and therefore increase the amount of business we currently lose overseas to other countries.

This is real. It sounds like crying but it is very real that we are losing business overseas to Japan, to Germany, to France, who have largely gone to school on our R&D in the United States and now through government funding or through mercantile-type arrangements in their own countries where the banks and the industry get together to fund a program, we are going to slip further and further behind.

Now that is okay. We have done that in other places. We can do it in water but I think in the case of water it is one place where we cannot afford to do it because it is important to life.

I would make one other point. My company currently spends about \$2 million a year of its own money on R&D in the water and related separations technology field, so when I say that we need more money, that all of us need more money here, it is not speaking from the position of saying that Government has to do everything, that we need a subsidy.

This industry is an amazing industry in that it has probably done more to reduce the cost of a liquid product than any other place. If you compare the efficiency, for example, of desalting water or refining water with the cost of refining oil and the markup on the product that comes out of the ground, God-given liquid in both cases, it would flabbergast you.

In asking for a subsidy—if you want to call it that—in terms of continuing support of these programs, it is not only important to these companies, it is really most important to our Nation.

Mr. YATES. What happens to your company, do you guess, if the so-called subsidy or the research funds are cut off?

Mr. GOLDSTEIN. What happens is that we will stay alive. The R&D that we are doing I think is very important. For example, one of our major projects is on seawater, we have built around a thousand plants around the world so I am not speaking as an R&D person exclusively, but our projects on seawater will just get slowed down another 5 to 10 years.

BRACKISH WATER PLANT TECHNOLOGY

Mr. YATES. What kinds of plants have you built throughout the world?

Mr. GOLDSTEIN. Mainly membrane brackish water plants.

Mr. YATES. Is the administration correct in saying that the technology for brackish water is so advanced that there need be no further research?

Mr. GOLDSTEIN. No, they are not because even the membrane—

Mr. YATES. Yes, but you have already built so many plants on that. Now is there some improvement that is needed in that process, too?

Mr. GOLDSTEIN. Absolutely. The people who are buying these plants now are the people whose desperation point has reached the need where they must try any technology to bail them out. Many of our plants provide good water supplies in certain types of areas but there are many different types of waters.

If you want to take the time, I have brought a map here from the U.S. Geological Survey which shows the United States water map, and if anybody wants to take a look at this I will hold it up. The yellow portion of that map is brackish water. That is what we have in the United States. There is another map that is put out by the U.S. Geological Survey which shows the balance of calcium sulfate water and sodium chloride water in the United States.

One point I would just make is that water is not the same. Water in one part of the world is not the same as water in another part of the world, and because you have been successful in treating one water does not mean you will be economically successful or effective in treating another.

What we are trying to do is solve the problems. Being able to run on a track at 10 minutes to the mile is not the same as being able to run a 4-minute mile. We are trying to run a 4-minute mile in this business, and that is why we need Government help.

Mr. YATES. Thank you for a very lucid explanation, Mr. Goldstein.

Does somebody else want to speak? Yes, sir?

FREEZE CRYSTALLIZATION

Mr. DAVIS. My name is Harold Davis, and I am President of Concentration Specialists. We are a relatively small company out of Massachusetts, and we work mainly with freeze crystallization.

Mr. YATES. With what?

Mr. DAVIS. With freeze crystallization as a desalting process. This is probably the least-developed of all of the desalting processes.

es. We look on it as a concentration process that has many uses other than just plain desalting.

When you consider overall water management as OWRT has to, you have to think of such things as: How does this fit into pollution control? How does it fit into the energy problems, the water problems associated with energy sources, and water reuse? With freezing, what we are talking about is a concentration process that uses less energy than distillation and evaporation for things like desalting but also for things like concentrating orange juice and other products.

Another crisis this country has in addition to a water problem coming up is, we have a productivity problem. If you are talking any one of these separation processes in their other applications, if you can desalt water which is probably one of the least valuable of all of the chemicals we have, think what this means to other chemicals and to increases in productivity.

The only place I have found in the Federal Government that responds to basic process research—which is what we are really talking about in freeze crystallization, there is no commercial plant—that has carried the biggest share of this as has been OWRT.

You asked the question, "Will a big company take it up?" Well, I see that it has taken us 20 years and about \$10 million of other people's money from various companies we have worked for, to know what we know. I see a potential market maybe for freezing systems for all these applications, if you exclude the \$100 million Saudi market, of maybe \$30 million a year. What company is going to put up the \$10 million it would take for a \$30 million-a-year business?

Just because the sale of equipment is not that big, that does not mean that it does not have significant impacts. What we are talking about is the processing of large volumes of fluids. These fluids, whether it is water or black liquor from a pulp mill, represent a significant amount of money. Just the concentration of whey with an evaporator from a middle-size cheese factory costs \$750,000 a year for fuel oil at the current rate of fuel oil.

Although the total cost of machinery does not represent gigantic markets, the use of that machinery to provide clear water or concentrated products is significant to the national needs both in productivity, in energy savings and to meet the water crisis.

COMMERCIAL DEVELOPMENT

Mr. YATES. How far away are you? How far away are you and Mr. Goldstein from what you consider to be commercial development?

Mr. DAVIS. We are getting some small amounts of commercial development from commercial companies but these are all for particular applications.

Mr. YATES. Can you give me an example of what you mean by that?

Mr. DAVIS. We currently have a joint venture going with a group from the dairy industry, sponsored by several of the big dairy co-ops and the research arm of the American Dairy Association.

This is to produce a piece of hardware using known technology, or at least technologies we know, and it is certainly not developed technology by any manner or means. It doesn't give us a chance to try a single new idea in this piece of equipment, to do research on what happens when you freeze concentrated milk.

Now there is going to be a problem in that lactose, which is one of the sugars in the milk or the whey, is going to precipitate out which may or may not be bad when you look at it.

Mr. YATES. Does that have to do with fat?

Mr. DAVIS. It does not really. It has to do with the sugars, and there are some people that cannot drink milk because of the lactose.

Mr. YATES. Right.

Mr. DAVIS. It is also what keeps you from being able to freeze milk.

Mr. YATES. Yes.

Mr. DAVIS. There is no place to do the research to make a better freezer?

Mr. YATES. You of course are intimately associated with the problem and we are generalists rather than specialists. Several years ago the Carter administration's budget provided for cutting out both Roswell and Wrightsville Beach, and we insisted, because we thought the water problem was so important. We insisted on keeping both of those experimental stations open.

I still think we were right, judging by what the witnesses from the Government told us, and what you are doing is reinforcing their testimony. You are moving it along.

Mr. DAVIS. Well, we have a plant at Wrightsville Beach, and it is still not working up to the full capacity after three years now because of developmental problems. This process had never been built before. That plant has been absolutely invaluable in lessons we have learned from it.

INDUSTRIAL WASTEWATER PURIFICATION

Mr. OBERMAYER. You asked how close are some of these things to commercialization?

Mr. YATES. Yes.

Mr. OBERMAYER. The area that we have been working on through OWRT that is closest to commercialization relates to the removal of organic impurities from industrial wastewater. We have developed a membrane process which can operate on—

Mr. YATES. Are you talking about PCB water?

Mr. OBERMAYER. It could be, yes.

Mr. YATES. OK.

Mr. OBERMAYER. We have developed a membrane process which can remove these organic impurities and it can operate on a modular basis. This means you can go to a point where you are producing the effluent and remove the impurities from the effluent rather than further downstream with a very large plant to purify a huge amount of water.

We carried out the initial feasibility study under contract from OWRT and our results were quite successful. As a matter of fact, I have a report of our initial work here. However, the fact that we

were successful in our initial R&D is not sufficient to have a commercial product.

What we need to do now is establish the economic viability of our process, determine such things as membrane life times. If the membranes will not last for a few years we do not have a product. We have to test them for a few years.

What is the pollutant removal efficiency? That will vary depending on the particular pollutant, and it will vary depending on the temperature of operation and the other kinds of impurities that might be in the water that we do or do not remove.

We have to do actual, in-plant testing to determine what are the right design factors. We have found a great deal of interest in the industry. Actually we have done a significant amount of market research and have discovered a large number of industries that are interested in our process, and we have picked on one. It happens to be the wood-preserving industry, which is particularly suitable and where they do not have an acceptable technique right now.

We have gotten one large company and one small company to agree to have us install our pilot scale equipment in their plant and test it and see how it operates in a real-life situation but that requires an additional amount of money, and before we get there or until we get there we cannot really expect to get venture capital financing or to really approach the problem of marketing it to the ultimate consumer. We need more testing and evaluation.

Mr. YATES. Suppose the funds are cut out. Would the companies with whom you deal provide the capital to permit your experiment?

Mr. OBERMAYER. These two companies, no. They have a specific problem and it is an industry-wide problem, and they are just one of the companies, each one is a company that has the problem. They are not going to invest in R&D to solve the industry-wide problem.

A manufacturer of equipment would potentially be interested, and the most receptive manufacturer of equipment we have found so far happens to be a French company. They are followed by a Japanese company.

Mr. YATES. Did you want to say something?

Mr. ANTHONY. Yes, Mr. Chairman.

My name is Tobias Anthony. I am Director of Washington Affairs for a relatively large company.

Mr. YATES. Which company?

Mr. ANTHONY. That is Research-Cottrell.

Mr. YATES. Okay.

Mr. ANTHONY. With me is Donald Douglas, who is Chairman of the Board of one of our small divisions, the Biphasic division.

We do about \$400 million a year in sales, so we are not tiny. I would like to tell you a little bit about our attitude towards investment in this kind of technology. For the past 5 years, our return on sales has been about 2 percent. As a consequence, in this day of high cost of capital and therefore in this constraint on the payback period, our interest in research—again, like the gentleman down at the other end of the table said—has to do with quick payoffs.

Companies our size are looking for larger markets, fast-growing markets to invest in. We will not have a tendency to invest in slow-

growth markets. Now we acquired the Biphase division—and I would like Donald to talk a little bit about that in a little while—because it was being funded to a large extent by Government contracts. Frankly, the Government contracts took care of the high-risk period from concept to pilot operation.

We have confidence in that engine that they have and are willing to work with that engine but most of the industries and most of the companies in industry are making under 4 or 5 percent return on profits. I am not talking about the pharmaceutical industry, I am not talking about the energy industry but I am talking about manufacturing industries.

As a consequence, when you stare at 15 to 20 percent return on capital most industries will have a tendency to shy away from the high-risk technologies. Whereas I understand what the President's objective is, I am saying that it excludes many companies my size—and we are not a small company—from these kinds of investments.

Now we have been banging on doors for quite a while because this biphase engine uses waste heat and produces potable water and electricity. The only ones that have given us any time of day are OWRT people. They saw the potential of it. I mean, we have talked to a lot of commercial customers. They are not willing to take the risk on something that has not been out in the marketplace and been proven and demonstrated to show the things that we say this engine can do in terms of generating potable water or electricity, unless it has been actually demonstrated. They have their own high-risk problems.

This is where this kind of long-range development which I understood the President was willing to fund has its long-term benefits. We are a little disappointed that this is the direction it is going.

Mr. YATES. I assume the President will establish some kind of funding in the Water Resources Council. The problem is that we do not know yet what the Water Resources Council is going to be or what it is going to do. That is just some idea for the future, and as one member of this committee it seems to me that until we know what it is going to do, what its function is, I do not know why we should disestablish OWRT. It does not make sense.

Mr. ANTHONY. We could see perhaps a year before that Water Resources Council's policy is established. We would have to stop work on this engine and devote our time to things with more near-term potential, and maybe we would go back to it, and maybe we would have all of our resources on some other application and this application would be bypassed.

BIPHASE TURBINE ENGINE

Mr. YATES. How much longer do you need before the engine proves itself?

Mr. ANTHONY. I would like to have Donald talk to that?

Mr. DOUGLAS. We have been working with the department for some time. This is a heat engine that takes waste heat. If you have a diesel engine, we can take the waste heat from that exhaust without any expenditure of fuel and use it to power an RO or use it to power our own seawater system, which is flashing the seawater through our engine to get potable drinking water.

Mr. YATES. It sounds like regeneration.

Mr. DOUGLAS. It is, definitely, and we are just to the point where we were about to get a demonstration program from OWRT. That demonstration program would prove the same points these gentlemen on the membrane side are talking about, their problems about proving the membrane. Our part of the problem is to prove that we can coat the interior of our turbine with the right kind of material so we can flash seawater without eating up all of our machinery.

We are the only device I know in this country that actually runs on brine. We found our desalination ability by flashing very, very briny brines, some of them 10 times brinier than seawater in geothermal.

There are several problems about being a manufacturer of machinery. There is no simple marketplace. I have not heard anybody say that but there isn't just a whole bunch of customers sitting out there for you to go sell a piece of machinery. I am a westerner. I am from California, and anybody that says there isn't a water problem does not know what they are talking about. There is a very serious water problem.

Mr. YATES. You have your share of the Colorado River.

Mr. DOUGLAS. We are going to get a lesser share of it when Arizona gets their piece.

Whenever you have coastline, and we have an awful lot of it in this country, and wherever you have an island you have the potential of making fresh water out of salt water by the use of our engine, either by directly making fresh water—and it only makes about a tenth as much fresh water driving itself as it does driving an RO plant. We can make 10 times more in an RO but there are some cases where just making a small amount of fresh water and electricity is terribly important.

We have been looking at Saipan, and there are many islands in the Pacific that are truly running into very serious problems where their water tables are going bad.

In my own State of California, in Oxnard, California, one of the great vegetable baskets of the country, the salt water intrusion is getting worse and worse. It is in my opinion as big or a bigger problem than the energy problem.

In the West, if you want to fight just go take a guy's fresh water to do shale or do any other process. I have been a rancher too, so I have some feel for it.

We are just at the point where we were going to get a demonstration program.

Mr. YATES. How much do you need for that?

Mr. DOUGLAS. We need about \$1.3 million. Maybe we can get it out of DOD; maybe we cannot. If we lose this it is going to be a couple of years to start all over again and find somebody else.

Mr. YATES. It is a cinch you cannot get it out of the Department of Energy. They are not organizing anything.

Mr. DOUGLAS. The Department of Energy, we were wiped out there.

Mr. YATES. Everybody has been wiped out.

Mr. DOUGLAS. We had a waste heat program there with this same turbine and that was cancelled, and now this is. We are batting two zeros.

We really are very close to doing something. The companies that bought us have put in over \$5 million worth of research in geothermal and we have just used all their money.

Mr. YATES. Do you mean Research-Cottrell?

Mr. DOUGLAS. Research-Cottrell and Delaval. We have taken all the money from them that they have to put into geothermal power, and there just isn't any money left for desalination. Being a westerner and an old anchor/farmer type too, I really believe that water is a critical problem and I hate to see it delayed.

Mr. YATES. That is why I do not understand why they do not give you the money because of the importance, why we do not consider this a high priority item.

Mr. DOUGLAS. I do not understand it either.

Mr. YATES. I do not mean OWRT; I mean Research-Cottrell and Delaval.

Mr. DOUGLAS. They have limited funds and they are giving us the money.

Mr. YATES. These are big corporations.

Mr. DOUGLAS. Yes, but they have the money and they are giving us money for where we have better—putting it bluntly—better customers. The utilities that want to make electricity are in geothermal, that is a customer you can feel.

You cannot find a water customer very easily. There are not very many water customers that buy machinery to make fresh water out of salt water, especially when we subsidize all kinds of fresh water systems. It is not very easy to find that customer.

Mr. YATES. Yes, sir?

Mr. BABOYIAN. I am Hugh Baboyian from UOP.

Mr. YATES. From where?

Mr. BABOYIAN. UOP, Incorporated. We are a fairly large company ourselves. We have a division of ours out in San Diego called the Fluid Systems Division that is engaged in the reverse osmosis business but we are also involved in the water business in many other ways, including the recovery of water and water well screens and so on.

I just wanted to go back a bit and readdress the initial portion of your question to us as to where the bottom line is on all this. As you I am sure know, the Government spends wisely and it does not spend wisely.

Mr. YATES. I know many of the places where it does not spend wisely.

Mr. BABOYIAN. Industry thinks we always spend wisely, or at least we try to make that distinction, at best.

Mr. YATES. I am not too certain.

Mr. BABOYIAN. I think you will find that all of us at this table have a vested interest in OWRT, one way or another.

Mr. YATES. I recognize that but I do not know where else to turn.

Mr. BABOYIAN. Taking that into account and trying to be objective, as we might, we will continue as an industry. Now some companies may not. There are in some cases companies that are too weak or that have other priorities, that this will not be a viable future for them without an OWRT but the chances are the industry will go on. I do not think there is much dispute that we will

drop off because a Government agency that has a relatively small budget in the scheme of the overall industry will drop off.

There is no doubt that we may remain competitive. It is not totally clear to us that we would lose out to the Japanese or the Germans. We may stay pretty well even with them or maintain the lead that OWRP and OSW have helped us obtain at this point.

There is also no doubt in my mind that what we are really talking about is the long-range research, the kind of stuff that brought us to where we are when the market really was not there when we started. That is what the Government has done for this desalination business. That is where these companies would be hurt, including ours.

It does not matter how large a company you are talking about, when you are talking about business investment in terms of research and bridging that gap between that technology and commercialization, that decision is more often than not based on business decisions and not the national interest.

Mr. YATES. I am sure that happens.

Mr. BABOYIAN. You are looking at the national interest. However, when you talk to us we are businessmen, and our people back home, wherever they are, are going to want to know what that ROI is on that significant investment.

Therefore, our short-term research will undoubtedly go on for those of us that survive. The long-term research will be hurt. The question is, in my mind at least, what is the proper role for the Government in this game?

Mr. YATES. Okay.

Mr. BABOYIAN. We agree with almost all of what Mr. Reagan has proposed in principle, as a company. We think it makes a lot of sense, that it is the time to review this whole thing.

We have the same kind of problems in synfuels, where we are experts in refining. We have many other interests in the energy business and we are finding our research and development budget in the synfuels area equally impacted by this kind of budget cut.

In this area we feel that the water situation in the United States is much more grave than the average citizen perceives it to be. The East Coast very recently escaped, and may not really have escaped from a very significant drought situation.

Mr. YATES. Drought, yes.

Mr. BABOYIAN. That is the East Coast. We are used to hearing about Kansas and Utah.

Mr. YATES. However, we are also finding out from States like New Jersey that have come in and testified that their water tables are being polluted by what is coming in through the surface and down into the water table.

Mr. BABOYIAN. Most of your public sits home and sees the water coming out of the tap, and figures somebody has done something to it so it is drinkable and they do not have to worry about it, until the crisis really hits.

Mr. YATES. In Washington they give you some water with the chlorine.

Mr. BABOYIAN. We also see demands are increasing between Government regulations on clean water and the impact of energy sources such as shale, coal slurry pipelines and whatever does come

into effect as a result of the downturn in imports that we are likely to see. All that is going to make it much more critical in the next 10 or 20 years.

This industry is one of the hopes, not the only hope but certainly one of the significant hopes to come up with clean water. If the OWRT is destroyed with an abrupt seizure of its funds, we are also killing demonstration facilities that are currently used by the industry that it is very difficult to replace.

FOREIGN COMPETITION

We are killing the gleam in a lot of long-range programs that are those programs that point to that 10- or 15-year mark down the road when we are going to see an additional significant impact on the water resource situation. We are also going to be starving off competition within an industry in the U.S. and allowing foreign competition—which continues to be funded by its own Government entity in some form or another, either directly or through the mercantile system—take a much more aggressive position.

The Japanese in my estimation are going to be in this business with both feet in this country, if they are not already, within a very few years. A lot of the patents that OWRT holds and that our industry holds are coming up to the point of expiration and renewal and so on. The Japanese have had enough lead time now with documentation in the public media and elsewhere to develop a pretty good running start.

There is no question that that will also take place to some extent in Europe but I think the Japanese will be the greatest concern.

Mr. YATES. What happens to your competitive position vis-a-vis the Japanese, possibly the Germans, and I heard somebody refer to a French machine, if this research stops? Will industry provide the funds to make up the difference and maintain a competitive position?

Mr. BABOYIAN. Some of it. There is no question in my mind that some of it will come from industry, that industry will take on a very aggressive short-term program. They will channel the monies, at least in our estimation we will probably channel money into short-term, turnaround-type applied research, the enhancement of existing techniques and systems.

However, the long-range programs, particularly the very promising long-range programs that are of broader concern to the country, and not so much to an individual ROI situation within a company but the longer-range thinking that the Government may be looking at, would be damaged. It is likely that they would not be funded.

GOVERNMENT SEED MONEY

Mr. YATES. How much does OWRT act in the nature of a spark? How frequently does OWRT act as an agency providing seed money which industry matches or provides its own, and which may not be invested in the event OWRT's monies are not there?

Mr. BABOYIAN. I can only speak for UOP but I think that has happened very often, and it has brought us to the table with our own interest added to and enhanced by their interests. Certainly in

the case of seawater desalination and brackish water treatment in this country, OWRT and OSW were the only games in town for quite a while and in many cases still are for some of us, even though there is interest.

I was interested in the comments that Mr. Goldstein made on the Yuma project. That project is not dead. We were participants in that project. No project goes forward without problems. We think those problems will be solved. I am sorry that they are not in at this point but rather than get into that discussion, we also do not want to leave the impression on the record that the project was killed because the technology is deficient. It is being reviewed and there are other participants that are also finding that they can deal with some of those problems.

Our concern really is the long range and the fact that that a Government-sanctioned program for those long-range efforts provides credibility for an industry like this which is still just coming over the horizon into a commercialized position.

Mr. YATES. I gather from the testimony that we have heard that OWRT has really provided a very essential service in stimulating, perhaps even initiating and stimulating the businesses in which you are engaged.

The second point that seems to be present is that the function for OWRT has not yet ceased, that you have not yet reached the point where you can launch yourselves or where you can be launched into a position where you can compete with the industries from other countries similarly engaged who are still receiving government help. I assume that is true not only in Japan but in Germany and other places as well.

Mr. BABOYIAN. That is correct.

Mr. YATES. Now I do not know whether we will be able to persuade the President about this.

This gentleman wants to speak.

Mr. LARSON. Mr. Chairman, my name is Roy Larson and I am Vice President of FilmTec Corporation. We are a small company in reverse osmosis but we go back to North Star Research Institute some 15 years ago.

I have in front of me—and it is also in my testimony—a list of some of the research programs that OSW and OWRT have supported at North Star and at FilmTec over the last 15 years. I just went through to try to get an idea of the amount of dollars that were involved over this time period and it comes out to, over 15 years, a modest \$1.7 million which is a little over \$100,000 a year.

However, I would like to point out that the outcome of this modest research has really acted as a seed and the catalyst to lead to the development of thin-film composite membranes. We talk about seawater desalting using RO, which are all thin-film composites.

During this time our scientists developed the first polysulfone support for thin-film composite membranes; developed the idea of a thin-film composite; and developed four new membranes and one or two of those were used by UOP in developing theirs, a larger company taking the research and proceeding with it.

Therefore, we moved from a completely research organization into forming a profitmaking company called FilmTec 3 years ago.

Our intent was not to exist on Government research but to use Government research to help the company grow and to further the technology.

During this time we have developed a new membrane that we call FT-30 that is now being used in various applications over the world on single-pass desalting, and we have a research team that spends something on the order of maybe \$200,000 a year on research. Our total sales are only approaching \$1 million, so if you take a yardstick of the percentage of sales that research would be maybe 5 to 7 percent. With our sales being only less than \$1 million there is no way we could support a \$200,000-a-year research effort.

However, I really believe that because of OWRT and OSW, they helped our company get started. We are reaching a point now where we are approaching profitability. We will continue because our sales are growing but there is no way we could support a 6-man research team for \$200,000 a year on sales that are only starting to go over \$1 million now.

Mr. YATES. What will happen if the money stops?

Mr. LARSON. We will have to either transfer these people into more short-term research to help our manufacturing, more to help solve our present-day problems, or seek outside funding from some other source.

However, I really believe that OWRT has played a role in getting an industry started that I do not think would have started. RO and desalting have gone through some very tough periods. Many companies have started and gone under because the market had not kept pace with what people thought it would. I think OWRT has played an excellent role in coordinating these research efforts and bringing contractors together to discuss new developments, to put on meetings.

I am also concerned about the threat from Japan. I know that there are about five companies over there now working on membranes. We have run into them in different parts of the world and they have an excellent technology coming. I am not saying we should run scared just because Japan is doing it but historically our country has been the leader in developing reverse osmosis technology, and original equipment manufacturers in other parts of the world have taken advantage of it. That is what has happened.

I am afraid that if OWRT is disbanded and does not continue, the lead agency that has been playing such a major role for all these years, it would be almost impossible to replace it. If it would, it would be several years before it would be replaced.

Mr. YATES. Did you want to say something?

Mr. LONSDALE. Yes, Mr. Yates.

My name is Harry Lonsdale. I am the President of Bend Research. We are located in Bend, Oregon. We are a small company.

Mr. YATES. You are a long way from home.

Mr. LONSDALE. A long way from home, that is true. I came here just for this, as a matter of fact.

We are a small, R&D-based, high-technology membrane research and development company. Like everyone else on this panel, we

have a vested interest in the survival of OWRT. I should say that at the outset.

I should also give you, I guess, my own personal slant. I am a fiscal conservative. I do not believe in bailing out Chrysler Corporation. I do not believe in loans to Lockheed, frankly.

Mr. YATES. How about water companies?

Mr. LONSDALE. Good question. Let's get into that.

Mr. YATES. Okay.

REVERSE OSMOSIS DESALTING

Mr. LONSDALE. In fact, what I am going to try to do is paint myself into a corner and then get myself back out, if I can. A small trick.

The facts are these, as I see them, and I have been associated with the desalting industry for almost 20 years now, particularly the membrane approach known as reverse osmosis desalting.

The reverse osmosis industry which is now almost exclusively a U.S.-based industry—we really have no competition in the world so far, that is, in terms of sales—is an industry of more than \$100 million per year, not inconsequential, in my book. One could well ask as the administration is asking, if we have a \$100-million-a-year industry, why can't it stand on its own? If you do not believe in bailing out Chrysler you would say, why should we help the water desalting industry? Good question, for which there is no totally adequate answer although I think I have one.

I might add that you have heard the words "reverse osmosis" and "RO" which are the same thing—thrown around at the table. Let me try to define that. Reverse osmosis is a process, now the leading desalting process in the world, developed almost exclusively by OWRT, for which they should be given great credit by the way, and I want to do that at this point if I can.

It is a process whereby you pressurize a salt solution and water goes through a membrane and salt stays behind. It is very simple. There is no heat involved. It is a very energy-efficient process. About three times less energy is required to desalt water by reverse osmosis than to desalt it by distillation, which is still the leading worldwide method for desalting, although reverse osmosis is making major inroads into the distillation industry.

It is already a large industry.

Mr. YATES. May I ask a question, just for my own information?

Mr. LONSDALE. Please.

Mr. YATES. As the water goes through the membrane, does it also free the water that goes through from the taste of salt?

Mr. LONSDALE. Yes.

Mr. YATES. It does? Is there good water at the other side?

Mr. LONSDALE. Potable water. Yes, sir.

Mr. YATES. Really?

Mr. LONSDALE. Excellent.

It is a process, as I say, for which OWRT gets the very lion's share of the credit for the development.

Now there are three kinds of water we are concerned with, and you have heard these terms, at least two of them, bandied about at the table today. There is brackish water which is water that contains about .1 to .5 percent dissolved salts. You can drink it but it

tastes bad. In fact, you could live on it but people do not want to drink brackish water.

Then there is a seawater which in fact you cannot drink and survive, as you well know. Then there is the third kind of water which in fact we have not yet addressed at this table, polluted waters, and the world is full of polluted waters.

Let me digress for just a second and talk about pollution because a little bit of pollutants go a long way. I would like to bring in the Ivory Soap commercial of about 30 years ago. On radio, back when I was a kid, anyway Ivory announced that their soap was ninety nine and forty-four one hundredths percent pure. That sounds awfully pure. In fact, sewer water is purer than that and we do not drink it.

Sewer water in fact is about 99.9 percent pure water. It is that last one tenth of one percent that makes it unpalatable. In fact, some waters are unusable even if they are 99.999 percent pure. If that last one thousandth of one percent impurity happens to be chromite iron or copper or a number of heavy metal ions or a number of other organic pollutants, you cannot drink it.

Therefore, polluted waters—of which there are an enormous quantity in the United States and around the world—require treatment. EPA is demanding that these waters be treated right now. They are setting standards, as they have been for the last 10 years.

Let me take those three water categories and run down them in terms of, "Is the problem solved or not?" Brackish water, the easiest water to desalt: In a sense I must confess that problem is virtually solved. If OWRT died today, the U.S. brackish water industry, that is, the membrane-based brackish water industry, would survive.

We would be hard-pressed by the Japanese, in my opinion. There is no doubt about it, the Japanese have targeted this membrane desalting industry as one they want to move into as they have done in so many industries, as you well know. They have targeted membranes, and for good reason. It is a very good industry, I might add. It can be used for a number of things besides water desalting.

Mr. YATES. May I interrupt for a minute to ask a question?

Mr. LONSDALE. Yes.

LIMITING OWRT RESEARCH

Mr. YATES. Would you therefore, based on what you just said, limit OWRT's research to waters other than brackish water?

Mr. LONSDALE. You might consider that strongly. I would not take that position necessarily because I do think we are in a race. As has been said around the table, other countries, particularly Japan, support industries they choose to support. One industry Japan wants to support is the desalting industry.

The decision there, it seems to me, is "Do we want to compete with Japan?" If we do not want to compete with Japan we will no doubt, in time, over a 10- or 20-year period, lose this industry to them, I believe. They continue to plow money into it. I have an announcement in a magazine called "Chemical Engineering" which says that MITI, the Ministry for International Trade and Industry, wants to plow \$124 million into membrane research over the next

10 years. That is bad news for the U.S. membrane-based industry, it seems to me.

BRACKISH WATER PROBLEM

Nevertheless, the brackish water problem is largely solved. The U.S. is clearly the world leader. If we want to remain the world leader someone has to continue to pump money into it. My vote is, OWRT should provide some support for long-range research even in brackish water desalting.

SEAWATER DESALTING

That brings us to seawater. We are close to a solution for seawater but not nearly as close as we are to brackish water. Seawater is much more difficult to treat. Here again, we are clearly the world leader in desalting seawater by membrane processes. We are not the world leader in desalting seawater in general, in which in fact the Japanese are already the leaders in distillation, which is still the most important method for desalting seawater.

The U.S. supplied a 3-million-gallons-per-day plant in Saudi Arabia just a couple of years ago, a completely U.S. plant based on U.S.-made membranes. In fact, in the membrane industry the U.S. is still the world leader. If we want to stay that way it seems to me money for advanced R&D has to come from some place.

POLLUTED WATER RESEARCH

That leads us to polluted waters, which I think are the real opportunity for OWRT. As I view the future of that organization, my feeling is that what they should be doing is trying to assist industry in meeting these very strict, EPA-imposed effluent standards. The Government is imposing those standards and it seems to me the Government has some obligation to help meet those standards as well.

EPA does no desalting research, no real pollution control research. Up until now, OWRT has basically done what little has been done in this country in that area. I say, let them continue to do so.

If we do not develop the technology to solve the cleanup of polluted waters, someone will, most likely the Japanese because they certainly have targeted this area, and we will lose that industry. The question is, who should pay for that development? I do believe the development has to come. We have polluted waters; we have to treat them.

Fluor Corporation has estimated that by the year 2000 some 30 billion gallons of water per day will be treated, that is, renovated or improved in quality, in the United States alone by the year 2000. The whole worldwide desalting market today is only about 2 million gallons per day. They are talking about 30 million gallons a day, domestic only, of reused water. Where is the technology to do that to come from?

My feeling is, OWRT should play a major role in the development of that technology, not to bail out ailing American industries like Chrysler Corporation but rather to make the U.S. number one

in reuse technology in the world. We have the opportunity to do so. I think we should go grab it.

Therefore, I say, in answer to the question you have asked all of us, "If there is no OWRT, what happens?" One, we will slowly lose our lead in membrane desalting, brackish and seawater clearly, and we will lose the golden opportunity to become number one in the world in treating polluted waters as well.

OWRT FUNDING IMPACT ON SMALL FIRMS

Obviously my own firm, Bend Research, has a fair amount to lose if OWRT dies today, as well as do other small firms. We could not continue to develop the processes we are working on which are now OWRT-supported. We just do not have the wherewithal. Our company has 27 people. We do a volume of business per year of about \$1 million. Our R&D budget is extremely small and must remain so until we are substantially larger.

The things we are working on, which are two membrane-based processes that deal with water, one is a thing we call "coupled transport". It is a method for removing dissolved metals from water. We think it has great potential in the treatment of electroplating wastes and other metal-finishing wastes. The second program we are working on involves an improved reverse osmosis membrane for desalting water.

I would like to conclude with this thought: This is not the time to turn our backs on water treatment. This is the cover of Newsweek, or at least a xerox copy thereof, of only about a month ago, "Are We Running Out of Water?" The whole article is very pessimistic. It is called "The Browning of America" if you read the article, which I just did myself recently, it is a pessimistic view of the future of American water quality and quantity.

Mr. YATES. It is interesting. I happened to be rummaging through some old papers over the weekend and there was a copy of Time magazine for the year 1965 which I had saved, and the title of its is, "Are We Running Out Of Water?" That was in 1965.

Mr. LONSDALE. Here it is 16 years later.

Mr. YATES. Of course, if you go back to 1952 to the report of the Paley Commission and to all of the problems that the Paley Commission said were going to happen, I do not know that we paid much attention to that report.

I am very much troubled by the Reagan recommendations, particularly in this case, because apart from the vested interests which you have, with the enormous problems that we have in this country relating to energy and looking for alternate fuels, water has to be as much of a necessity as oil.

Mr. LONSDALE. That is right. A friend of mine likes to say there may be a synfuel program but there will never be a synwater program, and that is probably true.

Mr. YATES. I guess that is true.

Let me ask you another question.

Mr. DOUGLAS. I did want to say one thing. It is a different way of looking at it but people drive me nuts sometimes, even in California, when they say we are not doing anything with solar energy. I would like to point out that the greatest example of solar energy in the world is fresh water. It got to be fresh water because the sun

put it there on top of the mountain. Every drop you waste is a waste of energy, and people will not face that issue.

I happen to be in the energy side, in trying to supply power cheaply to run these things and also how to recover the flow through the reverse osmosis on the recovery side.

OWRT BUREAUCRACY

Mr. YATES. Let me ask you some questions. We hear a lot of talk about the bureaucracy of the Federal Government. What has been your experience with OWRT? Should there be changes in its manner of doing business?

Mr. BABOYIAN. I do not know if I am the best one prepared to answer it but I would bet you I have negotiated more Government contracts with more of a variety of agencies than anybody at this table: DOD, certainly the Department of Interior, DOE, EPA, and about six or eight others because of our diversity as a company.

OWRT is a pleasure to work with. Nobody is a pleasure to work with in the bureaucracy, if you want to start there, but comparatively speaking with the difficulties we have had in dealing with R&D-type contracts with other entities in the U.S. Government, whether it is the Department of Defense or many others, the simplicity of dealing with the OWRT organization has been very easy.

Now the real problems come at the procurement level—not so much at the technical level—which is Interior and has some bearing on OWRT. The reason is because it is a small organization. The people know the people in the industry and we have close relations on a day-to-day, working, around-the-clock basis with people like that. They understand the problems of the industry and the contracts have been relatively simple compared to energy research contract or other types of research contracts.

There is no question that they have been a much more cooperative and understanding and businesslike group with a much less adversary relationship on negotiated contracts than many other entities within the Federal Government.

Mr. LONSDALE. I would second that, for sure.

Mr. LARSON. I would third.

Mr. YATES. I am glad to hear that.

Did you want to say something?

Mr. SEPHTON. I would just like to comment on my testimony. If my testimony is at all effective, then I think it should refute the notion that distillation had reached maturity in 1973 because I happen to be one of those who kept working in distillation since 1966.

Mr. YATES. Would you identify yourself for the record?

Mr. SEPHTON. My name is Hugo Sephton. I have been with the University of California seawater conversion laboratory until about three months ago. I am presently with Envirotech Corporation, and my intent at the present time is to try to move this technology into the marketplace.

Let me just briefly review: The OWRT had a vital role in first of all identifying this new technology between the years of 1969 to 1973. At that time of course distillation work by OWRT came to a

virtual halt on the premise that it had reached maturity. This was obviously not true of this particular technology.

Let me just proceed by saying that in 1975 Kaiser Engineers did a study based upon the data that we developed with OWRT/OSW sponsorship and showed that multistage flash, the then-leading technology, in their own terms was 54 percent more capital costly than this new technology.

Secondly, the water produced with this new technology would be 27 percent less costly. These are not my figures. These are the Kaiser Engineers' figures. They also concluded in their report to their management that this technology is ready for demonstration.

We proceeded to try to get demonstration funds from the OWRT and failed in that, not because they were not receptive to our proposals. They were always receptive to whatever we had to say but they time and again came back and said that distillation work had been foreclosed on the premise that it had been "mature".

We then proceeded to direct our proposals to the EPA to develop this technology for wastewater recovery and recycling. We were successful in that. We obtained a series of grants over about five years, culminating in the present demonstration of this technology at a large power plant site in Southern California.

Mr. YATES. Is that a photograph of Orange County?

Mr. SEPHTON. No, this is in San Bernardino County. This is a large Southern California Edison power plant site where we use waste heat, that is, terminal waste heat, namely turbine exhaust steam at 30 degrees centigrade to 50 degrees centigrade, to drive this entire distillation process.

What we have shown with OWRT cosponsorship at the present time, since the middle of last year, is that, yes, we can recover and do recover 98 percent of this wastewater as pure distilled water having a total dissolved salts content of only five parts per million. We do this with an energy consumption not of 30 kilowatt or 40 kilowatt hours per thousand gallons but 10 kilowatt hours per thousand gallons. This energy is required solely for recirculating, not to drive the process. The process is driven by the waste heat that we derive from the turbine.

Now this has an additional, very interesting fact, and that is namely this: Because you draw waste heat or turbine exhaust steam at the terminal pressure of the turbine, you cannot help but improve its efficiency and you do indeed do so. In fact, there is a net energy gain by this process of approximately 30 kilowatt hours per thousand gallons. That is the gain that you impose on the power plant because you are improving their capacity to reject waste heat to the atmosphere.

Therefore, at the present time the OWRT is cosponsoring this particular demonstration. We are about halfway through the demonstration. Their funding is only \$100,000 total. We need an additional \$100,000 to finalize this demonstration, which should put us in the marketplace at least within the United States.

Obviously it is a small demonstration. It is not a multimillion or even a million dollar demonstration. However, we are in a way pleased and also very displeased by the fact that the West German Government has just very recently, over the past year or so, start-

ed sponsoring a \$25 million demonstration of this technology in West Germany.

This large demonstration plant is presently being constructed in a Hamburg shipyard. It uses exactly our technology published in 40 papers. They have augmented it with some testing of their own but they are proceeding with the technology that we could not heretofore get off the pad, and we did try to get it off the pad.

In 1980 we teamed up with Ebasco in New York. We went to Brownsville, Texas and we talked to the city fathers of Brownsville. We also had representation at the meeting by the Texas Department of Water Resources. We submitted a proposal to the OWRT—encouraged, incidentally because they realized that this technology has some merit—but in the end they could not fund the proposal because they “lacked adequate funding”.

That was merely for a study, for a design study. However, even at that time we already could project that this technology will give us a performance ratio—and I will come back and define that term—it will give us a performance ratio of between 29 and 30 pounds of product per pound of steam. That is the definition of a performance ratio.

The West German Government is exactly going to demonstrate that, the performance ratio of 30, and it is based on this technology applied in two manners: in the first instance in a conventional multiple-effect series, and superimposed upon that the so-called vapor compression. These are well-known terms in the technology but I have to just mention them.

If you superimpose the two you get the best of a conventional distillation. It is not as effective as waste heat, obviously, because in the case of waste heat you do not have to pay for the driving energy but it is the most effective present technology.

Unfortunately, whenever other coming technologies—and I do not blame them, as a matter of fact, I worked in RO myself—but whenever or so often when a comparison is made between the energy yield of a distillation process and RO, people tend to go back to the established state of the art, mature, multistage flash. That is not the best technology that we have at this time, and I cite as evidence the fact that the West German Government is sponsoring this large demonstration.

Mr. YATES. Well, they can be wrong too, though, can't they?

Mr. SEPHTON. I beg your pardon?

Mr. YATES. I have seen our Government go wrong. It is interesting that they do do this.

Are they building it for their own shipyards or is it a privately-owned project?

Mr. SEPHTON. No, the project is being constructed on a barge. It will be barge-mounted. They had a model of this at the international meeting in Amsterdam last October. It is barge-mounted. That is one reason why it is so very expensive. It will be mobile and will be demonstrated in different parts of the world. It will demonstrate this technology, the performance ration of 30, and I have no doubt that it will succeed because I know basically the design that went into that particular—

PATENTS

Mr. YATES. Well, is that design patentable?

Mr. SEPHTON. We hold U.S. patents on it and patents in Britain and in several other countries but not in West Germany and not in Japan, for the simple reason that for years I was the small inventor that was mentioned further down the table and I had to do that on my own out of my own university salary. We just could not stretch that, so we do not have a West German patent, and neither do we have a Japanese patent.

Mr. YATES. It is too bad you could not stretch a little further.

Mr. SEPHTON. We do have a lot of know-how, and if we could just be diligent in demonstrating this technology I am convinced that we will have a good part of the market.

Mr. YATES. Good. That is fine.

Yes, Mr. Goldstein?

Mr. GOLDSTEIN. I would just like to pick up on a couple of points that I think maybe qualify some of the issues that were made before.

I think one point that might be looked at is the very simple point that this is sort of a repeat of what happened four or five years ago. Four or five years ago the Congress really took the initiative, particularly in 1977 and 1978, to keep what was then the demise of OSW alive and get OWRT going again.

I think one question you would have to ask yourself is, was that a smart decision? I think all the evidence that we have points to the fact that that was a very smart decision in terms of new membranes, in terms of new technology, in keeping the U.S. competitive—in keeping the leadership position going that we have talked about and that has been alluded to at this table and which is very real—it was a very smart decision.

The other side of that coin is, "Well, if it was a smart decision in the past that does not mean it is going to be a smart decision in the future. Maybe the time is up." However, I think you should weigh the risk that I was talking about before of shutting OWRT down, and realize first of all that if you shut it down you cannot put it back together again very easily. It is sort of a one-of-a-kind.

People were talking here about the relationships that have developed over the years. That has really taken a lot of time to happen. The people in OWRT are pros. They understand this business. They have grown up in this business.

I think the people who are on the other side, on the industrial side, are pros in their own right. They have developed something. It is a very unique relationship between industry and Government that I do not think is replicated any place that I am aware of in the U.S. Government/industry relations today.

If it is broken you cannot put the pieces together again, and so I would submit that it was a smart decision three or four years ago to continue it. It is a small cost, and I believe that even if it were difficult for the people in Congress to assess the truthfulness or the accuracy or the appropriateness of what we say in the light of our vested interests, it costs very little to find out whether we are right and it costs a hell of a lot if the administration is wrong. On that point alone I would submit that the smart decision is to leave OWRT in operation in some form.

The other point is, what would happen to all the money that has been invested to programs that are currently underway? I think there have been several different levels of suggestion as to how this thing should be phased out. The most recent suggestion I have heard is, "Do not phase it out at all, just chop it." That decision by itself, if it comes down to that, would be even more of a mistake in my opinion.

The OWRT has funds invested now in programs, some of which are in my own company—I did not mention those specifically but we have three—that it is like the football player who is running 95 yards and he has 5 more yards to go. Maybe that is 2 years worth of time. Somebody comes out and chops the runner's legs off.

That makes no sense. It is a waste of all the money that has been spent up until now. It is not to say that those programs will not get finished but they will get finished at such a far-out point in time that we will be in danger of losing the race to another runner who is coming up that same football field.

Mr. YATES. Thank you.

Mr. GOLDSTEIN. I submit that as an additional view.

Mr. LONSDALE. I just want to underline that. I agree completely with that. If we have persuaded you at all in the last hour or so, I would say that the thing I would like to underline the most is that I think it would be a disaster to cut OWRT precipitously.

If OWRT must shrink, let it shrink slowly, even cut its budget in half. However, to cut it precipitously I think would be a disastrous mistake at this point. I hope we have convinced you of that.

Mr. YATES. What is the feeling about whether it should shrink? How do you vote on shrinking it? From your testimony I get the impression you do not want to shrink it either. Is that right?

Mr. LARSON. In view of the Reagan administration's point of view, I think we may be faced with—

Mr. YATES. I happen not to agree with the Administration. I thought I would find out what you felt.

Mr. BABOYIAN. I think what you just heard there was just our worst-case fears, if you cannot do anything else for us. Obviously we would not be here if we thought they should shrink it and do away with it.

Mr. YATES. The thing that I miss—I think it has been a very constructive, valuable hearing—the thing I miss, though, are the two big companies, duPont and Dow. Is there a reason why they are not here?

Mr. GOLDSTEIN. I think there is, and I think it is a point I was making at the beginning. They know they can outlast everyone at this table.

Mr. YATES. They know they can outlast everyone at this table.

Mr. GOLDSTEIN. On the issue of R&D.

Mr. YATES. Dow is submitting a statement.

Mr. GOLDSTEIN. Good.

However, on the issue of things stretching out over time those are the fellows that know they can last, and they are right. They can last a long time. This is to them, in a way, what this program is to the U.S. Government, and it is very small.

STATE INSTITUTE WATER PROGRAM

Mr. YATES. I want to ask you another question. Have any of you had dealings with the State Institute Water Program, by any chance?

Mr. SEPHTON. I have had some.

Mr. YATES. Of course, You were at the University of California. What is your impression of that program?

Mr. SEPHTON. Well, I had only limited support for 1 year. I wish I had more. I never really managed to have more involvement because I was not very much part of the establishment. I really came in from the outside with OSW sponsorship for a particular project but during the time when they did sponsor me for this one year, we did generate another very significant project that lasted four years subsequent to that.

What we mainly did was to show that this technology in conjunction with a few other methods of agricultural wastewater treatment enabled one to use agricultural wastewater for power plant cooling. The pretreatment which we developed is a very interesting one, and it is mainly to soften the agricultural wastewater in a conventional manner, in the way that everybody and his uncle softens water for drinking, then concentrate the softened wastewater in a power plant cooling tower, finally concentrating it further by this method and then reusing this concentrate as the sole regenerant of the ion exchange resin. Therefore, you had a complete cyclic process without importing any chemicals, and that worked very well.

Mr. YATES. Did you want to say something?

Mr. LARSON. I just had one comment on, I think you are referring to State-supported research?

Mr. YATES. Federal support of State research.

Mr. LARSON. Oh, Federal support of State research?

Mr. YATES. Yes.

Mr. LARSON. Coordinated through the State, though.

Mr. YATES. How much do we give per year to the States? About \$150,000 each.

Mr. LARSON. We have done some of that. The problem that I have found in dealing with State agencies that are coordinating this type research is that the personalities come and go. Every time there is an administration change the people you are dealing with go, whereas with the Federal Government there is a continuity of personnel. I think it is personal relationships that are very important in doing good research too, to get to know one another. Certainly OWRT has been a case like that, keeping their staff for many years.

Mr. YATES. Dr. Obermayer?

Mr. OBERMAYER. Some 75 years ago we developed a series of antitrust laws in this country, and I think the reason we developed these antitrust laws was because once a company feels they are in a dominant position in the marketplace in a particular industry they want to shut out competition. That is not in the best interest of our Nation or our economy.

Mr. YATES. Are you arguing for maintaining the appropriations for the Federal Trade Commission?

Mr. OBERMAYER. That may be true as part of the whole process.

CLOSING REMARKS

Mr. YATES. At any rate, if you have nothing more to say let me again express the gratitude of the committee for your coming in here. As I say, it has been a very valuable contribution you have made. I think it is valuable because you have reinforced my opinion.

Ordinarily we would not call you in, we would just take the testimony of OWRT. It is unfortunate that we do not call more people in who are dealing with the industry.

In our Appropriations Committee hearings, I think unfortunately, all we get is the testimony of the Government, and the Government witnesses are mandated by OMB to support the Government budget. It makes it very difficult.

Therefore, we have what is known as "outside witnesses day" and people will come in one after another and testify. I have found that not to be as helpful as I would want it to be, probably because of the fault of the committee in not making enough time available. This, where you are all together and are in a position to help us, has been very helpful. You are not limited by the 5 minutes that the outside witnesses usually have.

This has been good. Is there anything else you want to tell us?
[No response.]

Mr. YATES. What I may do, with your permission, is send a copy of this transcript over to the Secretary of the Interior. The Government has some wasteful programs but it is amazing how many good ones it has, too.

At any rate, thank you very much.

Without objection your statements will be made a part of the record.

Mr. OBERMAYER. Mr. Yates, speaking for the nine of us, we want to thank you for allowing us to express our opinions today.

[The statements follow:]

Statement of H. K. Baboyian, Vice President, UOP Inc.
on the future of funding for the
Office of Water Research and Technology, Dept. of Interior,
before the
Subcommittee on Interior of the House Committee on Appropriations
March 23, 1981

Mr. Chairman and Members of the Committee:

I am H. K. Baboyian, Vice President of UOP Inc. Thank you for allowing us to appear before this Committee and comment on the Administration's recommendation that the Office of Water Research and Technology (OWRT) be abolished. The Fluid Systems Division of UOP Inc. is a company engaged in developing, manufacturing, and marketing reverse osmosis desalting technology and equipment in the United States and overseas. We believe that water resources here and in many other countries are and will continue to be in short supply, while at the same time the water demand on these resources continues to dramatically increase each year. OWRT and its predecessor, the Office of Saline Water, have provided a vital stimulus to our industry in developing the new technologies that we will need to help solve our water problems in the foreseeable future.

Research and development funded by OWRT has been partly responsible for the leadership position American companies now enjoy in the reverse osmosis field. This position, however, is being challenged by foreign companies which are being sponsored by major government R&D programs. Their governments' support is increasing each year. Without a vital OWRT, we believe companies like ours will continue to perform significant research and development and may remain competitive on a worldwide basis.

However, the type of long term R&D programs which have been federally supported may be significantly absent in industry's planning, if past experience can be a guide. The abrupt termination of OWRT will undoubtedly have a negative effect on our industry and we are concerned about the industry's ability to quickly fill the role that OWRT has played.

The U.S. is currently faced with many resource allocation and recovery problems, all of which are affected by the availability of water. You are aware of drought conditions currently prevalent throughout much of the U.S. Our energy programs, synfuels programs, industrial pollution control efforts, municipal water and sludge problems, and many other national priorities will need the assistance of this dynamic new technology of reverse osmosis more than ever. We suggest that further study should be given to the advisability of an abrupt termination of the useful programs like those at OWRT.

SUBCOMMITTEE ON INTERIOR AND RELATED AGENCIES

March 23, 1981

Sidney R. Yates, Chairman

OFFICE OF WATER RESEARCH AND TECHNOLOGY - INDUSTRY WITNESSES

Harold E. Davis

President

Concentration Specialists, Inc.

26 Dundee Park

Andover, MA 01810

TESTIMONY IN SUPPORT OF THE OFFICE OF WATER RESEARCH AND TECHNOLOGY PROGRAMS

Most of the testimony given at this hearing will concern the Country's growing water crisis and the need for further development work on the various desalting processes. We only have to read the newspapers to know that our water problems are grave, and I agree that much further research and development is necessary to produce lower cost, high purity water in the places where it is needed. However, I would like to discuss with you how these new developments and those created by the more than 20 years of past R&D effort by OWRT and its predecessor OSW, can be used to meet other national needs. This decade's environmental awareness and energy crisis, as well as our need for water, create a compelling requirement for these new technologies. Active government support for the continuing development of these processes will speed their utilization for resolving these problems.

As a bit of background, Concentration Specialists, Inc. is a small business, almost 5 years old, employing 27 people and doing roughly a million dollars of business a year. The purpose of the business is to develop and commercialize freeze crystallization as a desalting and concentration process. Freeze crystallization is the least developed of the desalting processes, and there are no commercial units in operation.

The processes developed for saline water conversion are general separation processes -- essentially, they all take a salt water stream and separate it into a pure water and a more concentrated salt solution. This same technology can be used to separate and concentrate many other solutions. Wastewaters can be effectively purified, producing reusable water and a concentrated waste that can be more economically treated for disposal or by-product recovery. (Often the economics of by-product recovery are unfavorable only because of the low concentration of the valuable material in the waste stream.) Another promising use of this technology is for industrial processing where the desalination processes can supplement or even replace conventional concentration equipment because of their high energy efficiency. Conventional concentration equipment uses the equivalent of over 110 million barrels of fuel per year. Desalting technologies, if fully developed and implemented in

a concerted program, could reduce this energy consumption by over 90%, a significant savings.

We are just beginning to see some of the results of the past 20 years of government supported desalting research and development in applications for pollution control and energy conservation. Membranes are used in power plants and electronic factories as the first stage of demineralization to produce ultrapure water. They are also used for the concentration and separation of proteins and sugar from cheese whey in combination with wastewater reclamation. Evaporation and membranes are used for the recovery and pollution control of plating solutions from metal plating and electronic circuit productions. Vapor compression evaporators used alone and in combination with membranes to concentrate cooling tower blowdown from power plants along the Colorado River, thus permitting more economical final disposal of these wastes.

In addition to direct application of the equipment, there have been valuable technology spinoffs. In the work on distillation, valuable engineering data and technology has been produced on ways to improve heat transfer performance, reduce corrosion, and reduce energy consumption. This data has great value to the utilities and process industries, as well as to the desalting industry. Significant advances have been made in polymer technology while striving for better membranes. Electrodialysis technology has been adapted to manufacture hypochlorite disinfectant (a less hazardous form of chlorine) on site -- and this is just the first of many electrochemical reaction applications that are now possible as a result of this technology. We are using some of the past freezing technology to develop solar assisted heat pumps for economical building heating and cooling.

These are just a few of the applications that currently use desalting technologies. Although government funding doesn't account alone for all of these applications without it and its support of basic process research, these technologies would not be developed to the present extent and there would not be a U.S. desalting industry ready to assist with the environmental and energy problems facing this Country.

There are many, many more applications for desalting technologies that will promote efficient energy use, conserve water and provide environmentally sound answers to pollution problems. However, widespread use requires further development and demonstrations of the technologies. The needs are there and how fast they will be met will depend on the funding available for the required development. Three general classifications describe the future needs for desalting technologies:

(1) Water Reuse:

The widespread internal reuse of industrial wastewaters along with reuse of municipal wastes for industrial purposes could free almost twice the amount of water for human uses than we currently consume. Since all of the "cheap water" resources have been developed, the ability to double the service without adding more collection and distribution facilities have major financial implications for municipalities. Water reuse is truly a valuable tool for overall water management planning.

(2) By-Product Recovery:

One of the objections to widespread water reuse is its cost. Often when desalting techniques are used, valuable chemicals can be recovered from the concentrate which could more than offset the additional costs. As an example, the wastes from new energy sources such as coal gasification plants contain quantities of chemicals which would further improve the economic attractiveness of coal conversion. In addition, the amount of water required for these processes would be substantially reduced through water reuse. This would certainly make these plants more welcome in our water-short West.

(3) Energy Savings:

Process industries such as pulp and paper, chemicals, foods and textiles have numerous applications for separation techniques ranging from concentrating frozen orange juice to crystallizing soda ash to recovering uranium by solution mining. Desalting technologies could be used in many of these cases with considerable energy savings. If freezing were used to replace the evaporators currently used for concentrating black liquor from pulp mills, my cursory calculations show that over 13 million barrels of oil could be saved each year for this one application. As additional benefit, pollution from one of the major sources of pulp mill effluent, the condensate stream, is eliminated.

(4) Productivity Increases:

When more product is made for less money, there is an increase in productivity. With energy costs rising as rapidly as they are, desalting technologies can make significant productivity advances. One study we recently did showed that if freeze crystallization was used for concentrating whey (a waste stream) from a middle sized cheese factory instead of evaporation, the fuel savings would be \$750,000/year.

However, the technology necessary to implement widespread use for these applications is not available. We are still an infant industry. The processes we are competing with -- distillation, extraction, absorption and evaporation -- are over 100 years old. More technology research, development and application demonstration is necessary before these innovative processes are ready to earn their rightful position in the market place.

Today, since I have been talking to you about pollution control, energy savings and chemical recovery, a reasonable question might be, "Why do we need the Office of Water Research and Technology?". I have three answers:

- (1) All of the applications I've discussed involve water and must be considered as part of any national water management plan to meet our need for supplies of high quality water.
- (2) The equipment developed doesn't differentiate between saline water and other chemically contaminated waters. The technology developed for desalting is directly applicable to meeting other national needs.
- (3) OWRT and its predecessor, OSW, is the only government agency funding the innovation of process technologies. Other agencies will fund applications development, but not research and the advancement of the technology. If I have a new idea for a component of the process, they are the only source of funds. It's true that I benefit from this research, but everyone else interested in the technology has access to the data.

The other question to be addressed today is whether industry will do its own research if OWRT does not exist. As a small businessman, I spend a considerable portion of our sales on what's called research -- actually it's only product development. I can also obtain some commercial support for some application development. However, I don't have the money and there is no source of non-governmental funding to test new ideas or to make real advances. At least in our field, the growth of technology will be severely limited without OWRT.

I have also worked for large companies, and I don't believe their attitude will be much different. Sure there will be a larger development budget than I can afford, but the budget will still be limited only to those short term projects with high return on investments. Again the future is sacrificed. There is a reason for the resistance by big business -- the cost of developing a new process is horrendously long and expensive. I estimate that the government and various

companies have spent over 20 years and \$10,000,000 in freeze crystallization and we still aren't there yet. Even though the amount of water conserved and energy saved by use of this technology can be very significant, my guess that the total market for equipment is only \$30,000,000 to \$50,000,000 annually. That's quite an investment for even the largest companies for a relatively limited return.

True innovation doesn't take place until a new product or process actually enters the market place. It is a long hard pull to the commercialization of a new technology. Step by step improvements are needed over a period of years. Government participation in these processes has speeded the transfer of desalting technologies by fostering competition and sharing the developmental costs.

Although there are now many applications for desalination technologies, OWRT and OSW are probably the major reason that the technology exists at all. I strongly believe one of the functions of our government is to help find solutions to our "Crises" by the development and transfer of technology. We have a pollution crisis, an energy crisis, a productivity crisis and now a water crisis. Our Country needs desalting technology for many aspects of water management. The other uses for these technologies are an added benefit. The money spent to develop new desalting processes will be returned in benefits many times over -- perhaps some of our "Crisis" will be downgraded to problems. We need OWRT to help us and the Country.

TESTIMONY BY DONALD W. DOUGLAS, JR.

to

The House Sub-committee on Interior Appropriations

Biphase Energy Systems has been developing a unique new turbine to use waste energy from diesel engines and other heat sources. The turbine output can be used to power desalination systems and make electricity with no additional fuel consumption. We have been studying this application for OWRT and have progressed to the point that we are ready to build and demonstrate a system for the OWRT.

We have identified a substantial interest by desalination equipment suppliers and by potential licensees in Japan for this type of system. However, they are not in the business of developing new turbomachinery and consequently, are not in a position to support the development.

Other government agencies such as the Navy and Army are interested in these systems because of the reduction of oil consumption and hence improvement in supply logistics for ships and Rapid Deployment Force bases. The OWRT project would directly benefit these Services. We are now attempting to establish an interest in funding our program by DOD but development of this funding source will result in at least a 1 - 2 year gap in the program.

Since our beginnings in 1976, Biphase has expended \$5.4million of company money in turbine development. During the current fiscal year, approximately \$1.6million will be invested in R&D. This total is the largest R&D expenditure of our parent companies, Research-Cottrell and Transamerica Delaval. No further R&D monies are available. It is unlikely Research-Cottrell would invest in the Biphase turbine aimed at this application without federal participation.

More than two-thirds of Research-Cottrell's sales are tied to pollution control markets. The firm constructs large facilities such as FGD scrubbers, cooling towers for powerplants and large

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chimneys, which in itself is a high-risk business. Because of the uncertainty of the business, several competitors, such as Envirotech, have left the market. Others, like CEA, are in Chapter 11 proceedings or have separated their marginally profitable pollution control businesses from their more profitable energy firms, as Peabody International has done.

Research-Cottrell's profit performance does not permit it to engage in future high-risk R&D ventures. It is a matter of public record that since 1975, our return on sales has averaged a little over 2%. In 1980, our return was 2.0% on sales of \$379 million. More than half the profits came from our energy businesses, a highly capital intensive segment. Our growth policy, like most other capital intensive industries, emphasizes acquisition of other firms, rather than investment in long term R&D because of the highly uncertain nature of the economy.

The high potential of the Biphase turbine encourages us to invest modestly in its development. We believe in it because it continues to show promise in the laboratory of producing energy from waste streams, while also producing potable water. The development we have proposed and which had been accepted by the Department of the Interior will be lost if the OWRT is disbanded.

STATEMENT
TO THE
HOUSE COMMITTEE ON APPROPRIATIONS
SUBCOMMITTEE ON THE INTERIOR
SIDNEY R. YATES, CHAIRMAN

MARCH 23, 1981

BY: ARTHUR L. GOLDSTEIN, PRESIDENT
IONICS, INCORPORATED, WATERTOWN, MASSACHUSETTS

Mr. Chairman, my name is Arthur L. Goldstein. I'm President of Ionics, Incorporated of Watertown, Massachusetts, a firm with over thirty years experience in the development and commercialization of desalting technology. I am here today with Mr. Joseph J. Strobel, former Assistant Director of the Office of Saline Water and now my associate at Ionics.

When I last made a statement before a House Interior Committee, the year was 1978 and the questions were the same as the ones we face today: Why does water desalting research and development (R&D) need continuing Government support and what will happen if such support is terminated? I believe that the events of the past few years show the wisdom of Congress' past decisions to support water R&D programs and that they also point the way for the rationale to continue such programs in the future.

In my judgment, the rationale of those within the Administration who wish to terminate Government support of water R&D and to abolish the Office of Water Research and Technology is based upon two judgments which can be summarized as follows:

1. The basic R&D for water desalting has been accomplished and there is, therefore, no need for Government support.
2. The U. S. desalting industry is economically viable and can afford and will undertake to do any R&D which may be required.

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BY: ARTHUR L. GOLDSTEIN, PRESIDENT
IONICS, INC., WATERTOWN, MASS.

I believe the information supplied below will illustrate why these judgments are incorrect and why the conclusion to terminate water R&D is not only incorrect but irresponsible.

1. The basic R&D for water desalting has been accomplished and, therefore, there is no further need for Government support.

This judgment can be refuted by looking separately at the R&D for the desalting of brackish waters (which are less than one-half as salty as sea water and which underlay two-thirds of the continental United States) and R&D for the desalting of sea water. With respect to brackish water R&D, the most significant information which refutes the Administration's position comes from the Department of Interior itself and relates to the \$400 Million Yuma, Arizona desalting plant. In a March 4, 1981 press release entitled Yuma Desalting Test Program Delayed, Acting Commissioner Cliff Barrett of Interior's Water and Power Resources Service announced that the "proof testing" for the 100 million gallon per day Yuma plant, which was supposed to desalt Colorado River water for Mexico and was to be the largest facility of its kind in the world, would be discontinued basically because the membranes, which are the heart of desalting equipment, did not perform as was expected! (A copy of that press release is attached.)

It confounds reason that the Administration can on the one hand propose to cancel R&D programs by claiming that R&D on water processes is complete and on the other hand discontinue temporarily and perhaps permanently its major high-technology construction program because it can not complete the required "proof testing" without more R&D work! Clearly, research can never be "over" until proof testing is successfully concluded.

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IONICS, INC., WATERTOWN, MASS.

Contrary to the Administration's position, the Yuma experience clearly indicates that the desalting industry has not completed the R&D or reached the point of proven commercial technology that the Administration believed when it proposed to cancel future R&D. The Yuma experience also indicates that had R&D funds not been severely cut in the past, the Government probably could have better avoided what could now turn out to be a \$400,000,000 mistake! If nothing more, properly run, low-cost water R&D programs can serve as an insurance policy to reduce the possibility of high-cost technological errors. All of the Governmental annually-funded desalination R&D programs together represent less than 5% of the cost of the Yuma project!

It appears from the evidence that our Department of the Interior has not really understood our current water problems and their potential solutions. In 1977 and 1978, my Company and others told the Government and the GAO that the membranes it was intending to use on the Yuma plant would fail and that all operating experience pointed to those membranes as being the poorest choice. Reopening the debate on what clearly appears to be a mistake that the Department of the Interior made in the past would not be productive. But neither should it be compounded by a second mistake which would cut out the very R&D that could ultimately eliminate future mistakes!

The above analysis pertains to R&D relating to the desalting of brackish waters of which the Colorado River is just one example where R&D problems are not solved. Other examples include high calcium sulfate waters, such as those found through the Western portion of the United States. My Company, Ionics, is involved with OWRT in a program which promises uniquely to improve membrane desalination of these highly mineralized plentiful waters. This important program, which is almost complete, will be cancelled if the Administration's proposal is accepted.

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IONICS, INC., WATERTOWN, MASS.

The R&D situation for sea water desalination is at an even earlier stage. Few desalination plants involving membranes are in operation on a commercial or experimental basis. Much work remains to demonstrate component life, system reliability and the costs of energy and operation. Given the fact that only two-thirds of 1% of the water on our planet is fresh water and 97% is sea water, it is clear that sea water will gradually expand as a source of supply and eventually play a major role in serving the world's water needs. Ionics, working with OWRT, is currently in the final stages of developing a new sea water desalination process, which after many years of effort is finally ready for initial testing at OWRT's Wrightsville Beach sea water test facility. That facility too will be shut down if the Administration's proposal is accepted.

2. The U. S. desalting industry is economically viable and can afford and will undertake to do any R&D which may be required.

The basis for this judgment is unclear. What is clear is that there is no booming U. S. desalting industry. What is also clear is that unless the desalting industry can see a booming business "around the corner" it will not do anything other than short-term R&D. Since the booming business has not arrived, it is a fair assumption that, in the absence of Government support, most long-term R&D (a) will not be done or (b) will be done very slowly over a long period of time.

Neither situation is in the best interest of our country. Doing water R&D slowly is harmful because:

1) It exposes our Nation to the prospect of not being ready when fresh water alternatives are required.

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IONICS, INC., WATERTOWN, MASS.

2) If water supplies are destroyed or deteriorated by accident or drought, we can't then say, "let's wait for water R&D to produce safe, proven, cost-effective techniques".

3) The nature of water R&D is laborious and the testing already takes several years before success can be known. Desalination and water processing research is not like that for an electronics device where one virtually knows the success of the R&D as soon as the device is plugged in. In the water field a processing device may work perfectly on day one - but after exposure to thousands of gallons of water may start to fail in subtle and not-so-subtle ways. "Proof testing" of water systems takes several years as the Government people at Yuma have found out.

4) Only very large companies can afford R&D which is strung out over many years. The innovative and entrepreneurial ideas of the smaller organizations can not survive in such an environment.

On the other hand, perhaps the judgment that the necessary water R&D will get done by industry is based on the assumption that our Nation can afford to allow the "business opportunity" in the desalination market to control the decision as to what water R&D, if any, will get done. If so, that is unfortunate because that rationale ignores the point that fresh water is very different from an ordinary business product. Water is different because it is necessary for life on this planet. Fresh water is not a discretionary product, such as an electronics product or process machinery, where it is efficient and socially safe to allow the market system to decide the appropriate R&D level. If the R&D for water were to be delayed until the market system would signal for more R&D, our country would be taking a very large

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IONICS, INC., WATERTOWN, MASS.

and very unnecessary risk with respect to the future availability of a precious resource - one that is even more important than oil or new energy sources.

In addition to the risk to human health, such a policy would also increase our Nation's risk of losing our technological position in desalination and, therefore, increase the amount of business we are currently losing to foreign competition, such as the Japanese, Korean, French and others who are building businesses primarily based on U. S. developed technology.

Why should we take unnecessary and potentially disastrous risks such as:

1. Building, operating and maintaining large capital projects, such as the Yuma Desalting Plant, without adequate R&D on membrane technology?
2. Believing that a slowed down R&D program will adequately safeguard our country against the possibility of not being ready for severe water problems.
3. Allowing foreign competitors to continue to drain away business, wages, and tax dollars which would otherwise remain in the U. S. when for a relatively small amount of money per year (\$15 to \$30 Million) we can effectively, through OWRT programs, buy an insurance policy for our water future?

In terms of help on projects such as Yuma alone, the cost would be extremely well justified, not to mention tax revenues and the un-told cost of a "water disaster".

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IONICS, INC., WATERTOWN, MASS.

My Company, Ionics, a world leader in the development and installation of water systems, is already supporting approximately \$2 Million per year of Company-sponsored R&D on water desalination and related technologies. This amount is as much as we can afford. Ionics is also currently involved with three funded R&D programs with the Department of the Interior's Office of Water Research and Technology:

- 1) The testing of a membrane stack at Roswell, New Mexico, which is expected to demonstrate superior operating performance on high calcium sulfate waters.
- 2) The development of a new sea water desalting process which after three years of effort is now ready for initial testing.
- 3) The development of a high area utilization membrane stack to improve the efficiency of desalination and to reduce desalting energy costs.

All of the above programs are nearing completion. The required funds to finish these programs have already been authorized and appropriated by the Government. It would be a tremendous waste not to allow these programs to be completed. Yet that is what we have now been told will happen! Cutting these programs would be like cutting off a runner's legs just as he is 100 yards from the finish of a race.

Ionics is also involved in a major OWRT program to demonstrate electric membrane desalting technology at a Government-chosen site at Alamogordo, New Mexico. The goal of the program is to show that new membranes can economically and reliably desalt highly mineralized waters of the type found in the Tularosa basin and in other Western States. The demonstration program is

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IONICS, INC., WATERTOWN, MASS.

certainly of major importance for our Nation's future security and well-being! It is also well known that any syn-fuels program in the Western States will require huge quantities of water. How can we as a Nation know which method to chose for desalination and treatment if we don't do the research and development necessary to prove the technologies? The Government's own experience at Yuma shows how far away our Nation was from proven water desalination technology when the people at the Department of the Interior's Bureau of Reclamation thought no more research would be necessary for the Yuma project.

Let's not continue to make the same mistake by sticking our heads in the sand on currently needed (and already funded) water R&D programs.

I urge your support to eliminate the proposed cut-back and to maintain the Office of Water Research and Technology with its planned approach to the efficient funding of future water R&D programs. I stand ready to assist in this endeavor in any way I can.

NOTE: Attached is a copy of a Technical Information Statement describing the project.
Thank you.

DEPARTMENT of the INTERIOR

news release

WATER AND POWER RESOURCES SERVICE Lower Colorado Region, Boulder City, Nevada

For Immediate Release

March 4, 1981
(Cole - 202-343-4662)
(Rhinehart - 702-293-8419)

YUMA DESALTING PLANT TEST PROGRAM DELAYED

Unexpected declines in equipment productivity have interrupted proof testing of membrane desalting equipment for the planned Yuma, Arizona Desalting Plant, the Interior Department said today.

Acting Commissioner Cliff Barrett of Interior's Water and Power Resources Service said the equipment, which meets contract requirements set by the Government for use in the Yuma facility, showed greater than expected decreases in desalting performance. Proof testing is expected to resume if productivity of the membrane desalting units can be restored by suitable cleaning process, he said.

Barrett said the testing halt is not expected to delay completion and startup of the Yuma plant, scheduled for 1986. "At this point," Barrett said, "uncertainty of future funding for the Colorado River Basin Salinity Control Project is more likely to delay plant completion than the equipment test interruption."

Regional Director Eugene Hinds at Boulder City, Nevada, said the manufacturers and Federal engineers are investigating the productivity decrease, and are hopeful desired performance levels can soon be restored.

Equipment proof testing was intended to permit early identification and correction of any unforeseen problems, such as the productivity declines now being experienced, Barrett said. The equipment suppliers are investigating new techniques to restore output levels of desalted water, since earlier membrane cleaning methods did not achieve desired results.

The desalting equipment is supplied under contract by Fluid Systems Division of Universal Oil Products, of San Diego, California, and by Hydranautics, Inc., of Santa Barbara, California. Under terms of the contracts, which were awarded in 1978, Fluid Systems will produce about three-fourths of the reverse osmosis membrane desalting equipment for the Yuma plant, and Hydranautics will produce about one-fourth.

Prototypes of equipment from both companies were tested extensively, and operated for sustained periods at the Yuma Desalting Test Facility, before the contracts were awarded. Additional proof testing, required by the contracts, is run on units representative of the actual equipment to be furnished for use in the plant. Proof tests confirm that the equipment has the mechanical integrity and productivity necessary to perform as required during sustained operation. The proof test program on both contractors' units has been underway just over a year.

The Yuma Desalting Plant is the central feature of the Colorado River Basin Salinity Control Project, a Federally sponsored project to meet treaty obligations placing limits on the salt content of Colorado River water flowing into Mexico.

NOTE: Attached is a copy of a Technical Information Statement describing the proof test delay.

TECHNICAL INFORMATION STATEMENT--YUMA DESALTING TEST FACILITY

Proof testing of membrane desalting equipment for Yuma Desalting Plant is being extended because of unexpected declines in productivity. The contractors and the Water and Power Resources Service are currently investigating the cause of the decline. Investigators hope to restore equipment performance to the levels anticipated so proof testing can begin again.

The desalting equipment was purchased under contracts awarded in October 1978 to Hydranautics, Inc., of Santa Barbara, California, and Fluid Systems Division, Universal Oil Products, of San Diego, California. The Hydranautics units are rated at 22.35 Mgal/d, the Fluid Systems units at 73.1 Mgal/d.

The contractors were required to furnish proof test units representative of the actual equipment that would be used in the desalting plant and which the Service has been operationally testing at its Yuma Desalting Test Facility near Yuma, Arizona. The proof testing has two objectives: (1) demonstrate the mechanical integrity and hydraulic adequacy of the proposed equipment; and (2) demonstrate that the membrane elements conform to the first portion of the time-dependent performance curve.

Hydranautics, using membrane elements supplied by Desalination Systems, Inc., of Escondido, California, initiated proof testing on February 6, 1980. Early test results indicated a flux (productivity) decline slightly greater than expected by the Service. Hydranautics requested that the proof unit be chemically cleaned to restore performance; this was accomplished in early August.

The flux dropped significantly as a result of the cleaning. The cause of the drop remains unexplained. However, Hydranautics has developed a cleaning solution that has been tried on individual vessels of the proof test unit, and this solution appears to restore performance significantly above the level experienced prior to the August cleaning. Hydranautics hopes to restore performance on the entire proof test unit with this solution. If they are successful, the Service intends to reinstitute the Hydranautics proof test.

Fluid Systems began proof tests on December 20, 1979, using membrane elements they manufacture. Early test results indicated a flux decline of about twice that expected by the Service. Fluid Systems also requested that their unit be chemically cleaned, and this was performed in May 1980. However, no sustained improvement in performance resulted from the cleaning.

Fluid Systems now has an investigative program underway to determine the cause of the abnormal flux decline and how to improve performance. They have also performed a further investigative program that is under review by the Service. If the program is acceptable and if Fluid Systems can restore unit performance to expected levels, the Service will reinstitute proof testing of the unit.

Meanwhile, design and construction of the Yuma Desalting Plant continues. Site preparation and plant intake construction is nearing completion. Bids have been received for switchyard and transmission line construction, but they have not yet been awarded. The Invitation for Bid on remaining plant construction is scheduled to be issued in March 1982.

**Statement Before Subcommittee
on Interior and Related Agencies
Committee on Appropriation**

by

Roy E. Larson, Vice President

**FilmTec Corporation
15305 Minnetonka Blvd.
Minnetonka, MN 55343**

March 23, 1981

The Yuma Irrigation Project is the central feature of the Colorado River Basin Salinity Control Project, a federally sponsored project to meet present and future irrigation water needs on the salt content of Colorado River water flowing into Mexico.

Attached is a copy of a technical information document describing the project and the Yuma Irrigation Project.

Introduction

FilmTec manufactures thin film composite (high technology) reverse osmosis (RO) elements for water desalination. It is a 1977 spin-off of the North Star Division of Midwest Research Institute (formerly North Star Research Institute), where pioneering RO membrane research was carried out for the Office of Water Research and Technology (OWRT) and its predecessor, the Office of Saline Water (OSW), over the period from 1965-1977. FilmTec was awarded its first research contract with the OWRT in September, 1978, and has since had continuing research programs with that agency. A list of relevant research contracts is included with this testimony. Until September of 1980, when FilmTec began to market a significant volume of its RO products, its research contracts accounted for the largest share of its revenues. Without these contracts FilmTec's products would have been greatly delayed in reaching the marketplace and in fact, the company's survival would have been in jeopardy. FilmTec is a small company, just emerging from its development stage, with revenues currently approaching \$1 million annually.

The North Star research team has been widely recognized as making major contributions to the development of reverse osmosis membrane technology for water desalination applications. The key people from the same team were founders of FilmTec Corporation and have continued research applied to reverse osmosis membranes for the OWRT. Among the major accomplishments of the North Star team are included such items as: 1) development of the first ultrathin reverse osmosis membrane (cellulose acetate); 2) development of microporous polysulfone as a practical support material for ultrathin reverse osmosis membranes; 3) development of the concept of the thin-film composite reverse osmosis membrane formed by in situ formation of a membrane on the surface of a microporous polysulfone support; 4) invention of the NS-100 membrane as the first practical thin-film composite RO membrane; 5) invention of the NS-200, another approach to a thin-film composite RO membrane; and 6) invention of NS-300 as the first thin-film composite with improved chlorine resistance.

The research at North Star was a definite catalyst to the development of second generation reverse osmosis membranes by the desalination industry; for example the NS-100 was the forerunner of several current membranes marketed by Universal Oil Products (UOP) for seawater and many other difficult separations (PA-300, RC-100). Other companies in the United States and several Japanese companies are known to be developing thin-film composite types of reverse osmosis membranes to permit reverse osmosis to be used in many applications for which cellulose acetate is not suitable, and eventually to replace cellulose acetate membranes more broadly.

The research programs carried out at FilmTec since its formation have been largely oriented toward means of improving the effectiveness of membranes and toward developing improved manufacturing processes for the best of the current thin-film composite RO membranes. The technical expertise in reverse osmosis membrane research that was developed under the OSW and OWRT contracts at North Star has been transferred to a research and manufacturing capability at FilmTec. The research programs supported by the OWRT at FilmTec have been major contributors to bringing FilmTec's new thin-film composite RO membrane (FT-30) to the status of a commercially available product. The FT-30 membrane is widely recognized as one of the best available on the basis of its salt separating capability, flow properties, and chemical stability. At present, FilmTec is limited

to production of reverse osmosis elements for small seawater and other systems, generally 10,000 gallons per day or less. It plans to build equipment to expand this capability to meet the needs of large-scale desalination systems. Although FilmTec is beginning to sell significant quantities of RO materials, it still has not reached the point of profitability.

Effect of cutback in water desalination program on research in the United States

I believe that the saline water program cutback will have a severe adverse effect upon desalination research in this country. This comes at a time when rapid progress is being made in membrane technology that is applicable to many of the existing and projected water supply problems, both in this country and abroad. It also comes at a time when rapid progress is being made in Japan in membrane technology applied to reverse osmosis. Several new and apparently excellent membranes have been developed recently in Japan and are beginning to appear on the international market; they are highly competitive with membranes made in the United States. Further, the Japanese are actively promoting new research in areas related to reverse osmosis membrane technology. A recent news brief in Chemical Engineering magazine (Dec. 1, 1980, p.35) referred to a Japanese industry proposal that industries develop basic polymer technology for commercialization in the 1990's. Five leading chemical companies in Japan have begun organizing a research association and are lobbying for \$123.8 million dollars in funding over a 10 year period from the Japanese Ministry of Finance, including \$4.95 million in the first year. One of the four specific areas chosen for research activities was high efficiency membranes for material separation (reverse osmosis and ultrafiltration membranes). In essence, the Japanese government has recognized reverse osmosis desalination as one of the major new product markets in the 1990's, and intends to promote the efforts of Japanese industry into this market.

Until quite recently the U.S. industry, largely because of early funding from Federal Government for the development of membrane technology, had a large lead in reverse osmosis technology and supplied most of the world's market for these products. This was during a period when commercial sales of reverse osmosis equipment were far too low to support a significant research effort by any but the largest corporations. Now that this marketplace is beginning to grow, the U.S. lead is rapidly disappearing because of the Japanese efforts. I believe that, for the United States to maintain its position in this very important part of desalination technology, research activities should be increased rather than curtailed. Furthermore, it is not at all certain that the level of research that companies, particularly the smaller companies that have contributed greatly to the technology development, can afford at this time is adequate to meet the challenge of our rapidly approaching severe water problems and the challenge of competition in the international marketplace.

Most reverse osmosis membranes manufactured and sold today are cellulose acetate membranes. They are improvements over, but suffer many of the same limitations as, the first reverse osmosis membranes developed about 20 years ago. They are not able to withstand the wide pH range (acidic to caustic range) necessary for many applications, are damaged by many chemical species, are generally not able to bring about high levels of separation of dissolved solids from water, are readily attacked by micro-organisms present in many water systems, and often have

severe flow limitations. The second generation membranes represented by the polyamide membranes offer many advantages over the cellulose acetate products. These include generally greater chemical resistance, higher salt rejection, greater water flow, resistance to biodegradation and applicability to a broader field of separations. However even these membranes have shortcomings that must be overcome to provide for our future drinking water and industrial needs. For example, they do not have adequate resistance to degradation by chlorine for many direct applications in the drinking water field; further they do not have adequate separating capability for some of the small organic molecules among the toxic substances presently being found in some drinking water supplies. A third generation of membrane will be required to deal with some of our world-wide water problems, to provide for the extended water re-use that will be needed in our water-short areas, and to apply to the many potential industrial separations that offer challenges for this process. We do not believe that most of the smaller companies involved in membrane development and manufacture in the United States are in a position to support research programs themselves that are beyond the R & D needed for solution to their short-range manufacturing and applications problems. Further, without continued Federal support, the U.S. industry would lose the efforts of a lead governmental agency to coordinate research efforts and promote scientific interchange (such as achieved in a recent OWRT Contractors' Symposium at its Wrightsville Beach Test Facility, cf. Desalination, Vol.34, No.3, pp.329-332, 1980).

Effect of desalination cutback on research and development at FilmTec Corporation

As mentioned earlier FilmTec's early survival was dependent to a large extent upon research funding from the OWRT. The original founding of FilmTec was not predicated on a need to garner federal research contracts for survival. But, in the course of developing a new high technology reverse osmosis desalting membrane, FilmTec found itself dependent in great measure on OWRT to support its necessary R & D expenses. Without that funding, it would have been much more difficult for FilmTec to bring its new product to the point of commercial viability. This product has now received world-wide acceptance as an outstanding reverse osmosis membrane for a wide range of application. Early sales are being made not only in the United States but in several other countries; our product is finding its way into shipboard drinking water systems being sold world wide, offshore oil platforms, systems for hemodialysis water supply, water purification for laboratory use, point-of-use water purification (for homes and commercial establishments), and other applications. At our present stage of development and level of sales, the continued research and development required for our manufacturing process and to solve our day-to-day problems taxes our financial capability. We have put together an R & D staff capable of inventing new and advanced membrane desalination products, but we are not able to support this R & D staff (which has been largely funded on government research contract) from our own operating funds. We will necessarily have to cut back our research program unless sources of funding from outside the company can be found. This will severely impact any new product we may contemplate and will limit our ability to develop into a competitive force in the marketplace. We simply do not have the resources necessary to continue supporting research by our outstanding membrane scientists, those that have been so productive in past programs at both North Star and FilmTec.

Conclusions

I believe that the proposed cutback in funding for the saline water research program will have a negative impact on water desalting technology in the United States. National and international needs for clean, fresh water are growing, and the quality of the water supplies available is progressively worsening. It is almost certain that a water supply crisis is approaching that will rival, and possibly exceed, in scope and duration, our present energy supply problem. I believe that current desalination technology, while good, must be substantially improved to meet the challenge in the years ahead.

The smaller companies that have been among the leaders in innovation have outstanding research capabilities that may well be lost without continuing research contracts. These companies cannot afford to maintain existing levels of research activity from their current revenues. The saline water research program has spawned a new industry in the U.S. and in the world. This is an outstanding example of a successful government program, and I believe it has returned far more to the U.S. in new employment, product exports, and federal and state tax returns than its relatively small cost. Many successful companies, particularly small business, owe their existence to this technology. For example, a dozen small companies have entered the RO market in the last year or two for small shipboard seawater desalting systems, and many more in the less exotic, but perhaps more important, home water purification market.

While the U.S. has been largely responsible for developing membrane desalination technology, and at one time had a virtual monopoly on this market, others, primarily the Japanese, are rapidly catching up. I believe that, for the U.S. to remain in the forefront of this critical technology and maintain a high market share in the world marketplace, a strong research activity must be maintained in water desalination, and the federal saline water program is an essential ingredient at least for the next few years.

FEDERAL SALINE WATER RESEARCH CONTRACTS
PERFORMED AT FILMTEC CORPORATION AND AT NORTH STAR RESEARCH INSTITUTE

PLACE	CONTRACT NUMBER	TITLE	REPORT AND PUBLICATION NUMBERS
North Star	14-01-0001-457	Fabrication and Evaluation of New Ultrathin Reverse Osmosis Membranes	OSW #177 (PB-177083) OSW #247 (PB-182881)
North Star	14-01-0001-1143	Development of New Reverse Osmosis Membranes for Desalination	OSW #359 (PB-206329)
North Star	14-01-0001-1696	Development of New Reverse Osmosis Membranes for Desalination	OSW #531 (PB-201016) OSW #725 (PB-206447) OSW #659 (PB-202748)
North Star	14-30-2839	Development and Demonstration of Tubular Regenerable Ultrathin Membranes for Desalination	OSW Informal Final Report
North Star	14-30-2883	In Situ-Formed Condensation Polymers for Reverse Osmosis Membranes	OSW #927 (PB-229337) OSW #982 (PB-234198) OSW #874 (PB-223137) OWRT #76-2 (PB-248670)
MRI-North Star	14-30-3298	Continued Evaluation of In Situ-Formed Condensation Polymers for Reverse Osmosis Membranes	OWRT #76-40 (PB-253193)
MRI-North Star	14-34-001-6521	Research on In Situ-Formed Condensation Polymers for Reverse Osmosis Membranes	(PB-288387)
FilmTec	14-34-0001-8512	Advanced Poly(Piperazineamide) Reverse Osmosis Membranes	(PB-80-127574)
FilmTec	14-34-0001-8547	Development of Novel Polypiperazine-amide Membranes in Spiral-Wound Modules	
FilmTec	14-34-0001-8547 (Continued)	Development of FT-30 Membranes in Spiral-Wound Modules	Report in Preparation
FilmTec	14-34-0001-8804	Improved Pretreatment Processes for Wastewater Reuse by Reverse Osmosis	OWRT #RU-80/3
FilmTec	14-34-0001-9415	Post-Treatment Processes for Reverse Osmosis Membranes	Report in Preparation
FilmTec	14-34-0001-0443	Improved Porous Supports for Thin-Film Composite Reverse Osmosis Membranes	Research in Progress

ACCOMPLISHMENTS

First ultrathin cellulose acetate membrane
First polysulfone support for thin-film composite membranes (now industry standard)
First interfacial polymerization for reverse osmosis membranes (basis of most thin-film composite membranes)
First thin-film composite reverse osmosis membrane (industry goal for advanced membranes)
New company formed to utilize advanced technology
Membrane manufacturing process developed to commercialize new advanced reverse osmosis membrane

Contract Values

North Star and MRI-North Star: approximately \$1 million (1965-1977)
FilmTec Corporation: approximately \$0.7 million (1978 to present)

STATEMENT TO HOUSE COMMITTEE ON APPROPRIATIONS

SUBCOMMITTEE ON INTERIOR

Sidney R. Yates, Chairman

ON

OFFICE OF WATER RESEARCH AND TECHNOLOGY APPROPRIATIONS

By

Dr. Harold K. Lonsdale, President
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64550 Research Road
Bend, Oregon 97701

March 23, 1981

My name is Harry Lonsdale. I am the president of Bend Research, Inc. of Bend, Oregon. Ours is a young, high technology organization specializing in membranes and their applications. Our firm was founded in 1975 and now employs 27 people, many of them holding advanced degrees. We have a wide variety of products and processes under development, including efficient water desalting membranes, an important new process for water pollution control, a membrane-based process for extracting oxygen directly from air for use in the production of synthetic fuels from coal, membrane-based insect control devices that will soon be in use in the current fruit fly infestation of the California citrus crop, and many others. Our firm is just beginning to make the transition from predominately R and D-based activity to production and marketing of our products.

I am here today partly because of the interest of our firm in the future of the Office of Water Research and Technology (OWRT), but also because of my knowledge of the water desalting industry, an industry that I have seen evolve and grow over the past twenty years. As recently as the 1960's, there was only one way to desalt water on a significant scale: distillation. Today, distillation is being rapidly displaced by a new membrane-based process called reverse osmosis. This new process consumes only about one-third as much energy as distillation; it is a direct result of the OWRT program.

I have spent virtually my entire career in membrane research and development, a field that I believe is still in its infancy. I am the editor of the international Journal of Membrane Science, so I feel qualified to speak for the entire membrane industry, an industry, incidentally, in which the United States is clearly the world leader.

There are three matters that I want to comment on today. The first of these is a review of OWRT and its accomplishments. The second is the future role of OWRT as I see it, and the third concerns the future of the U.S. - based membrane industry in the eventuality that OWRT ceases to exist.

I. The Achievements of OWRT

The list of achievements is a long one, and I want to dwell on the one I am most familiar with: the development of the reverse osmosis process of desalting water. Unequivocally, reverse osmosis is an OWRT development. It came about through an OWRT-sponsored search in the 1950's and 60's for novel methods for desalting water. That search resulted in the development of exquisitely thin membranes that can convert seawater to potable water. Those membranes represent a technological breakthrough: their effective thickness is less than the wave length of light. Thus, if I were holding one up in my hand, you would not be able to see it because it is so thin. Yet these membranes can now be made without leaks or imperfections. Those membranes and the industry they spawned are directly benefiting the tens of thousands of users of desalted water in the U.S. and around the world. The world's largest membrane-based plant for desalting seawater was recently installed by a U.S. manufacturer in Saudi Arabia at a cost of some \$30 million. The reverse osmosis process is to be used to reduce the salinity of the Colorado River in the Yuma desalting project, the world's largest desalination plant with 100 million gallons per day capacity. Reverse osmosis is now more than a \$100 million dollar per year industry, and it is almost entirely a U.S. industry. Some evidence of its importance can be drawn from the recent announcement (Chemical Engineering, December 1, 1980, p. 27) that the Japanese Ministry of International Trade

and Industry proposes to spend more than \$100 million over a several-year period to develop high efficiency membranes for reverse osmosis and other separations. The European countries are similarly interested, and Italy, for example, already has a membrane program in being.

Without OWRT, it is clear to me that there would not be a major reverse osmosis industry, and what industry might have developed might not be U.S.-based.

II. The Future Role of OWRT

The challenge of economically desalting water has to a large extent been met, although to maintain our world leadership we must continue a vigorous R&D effort. The future challenge lies not in desalting but rather in reuse of impaired waters and in pollution control, two problems that go hand-in-hand. Over the past decade the Environmental Protection Agency has been setting and resetting water effluent standards. Yet, even though these standards are federally imposed, there has been virtually no federal program to fund innovative solutions to the problems of pollution control and water reuse. The EPA standards call for the application of what is referred to as Best Available Technology to treat effluents. Yet the Best Available Technology is, in fact, generally archaic and much of it was developed in the days of cheap energy. What we face, then, is an opportunity for the U.S. to take the world lead in developing new, energy-efficient processes for treating these impaired waters so that by-products can be recovered and the water can be reused. This development of new technology is completely consistent with the currently accepted "supply-side" economics: what we need to create new jobs and improve our balance of payments is to develop and exploit new technology in this country.

The need for technology aimed at water treatment is, in fact, much greater than the need for water desalting. Fluor Corporation recently completed an extensive study in which they project a water reuse industry that will be treating 30 billion gallons of water per day by the year 2000 in the U.S. alone. This is to be compared with a current worldwide desalting capacity of only about 2 billion gallons per day.

It is clear to me that new technologies will be needed to treat these impaired waters in an energy-efficient manner. It is equally clear that innovative, entrepreneurial Americans can devise and perfect these new technologies, given sufficient incentive. The central question is this: To what extent is this a national problem to which Federal assets should be applied? The question can also be asked in this way: If this is such an important new opportunity, why doesn't U.S. industry do the necessary R&D and develop the technology on its own? The answer is complex. Let me state at the outset that I am a fiscal conservative. I do not believe, for example, in bailing out sick corporations like Chrysler or Lockheed with Federal funds and I strongly believe in a balanced budget and reduced Federal expenditures. However, water is a national commodity and has been throughout American history. Water pollution generated in Pittsburgh affects the water supplies of Cincinnati, New Orleans, and many other cities. Excessive groundwater withdrawals in the Los Angeles basin or in the Ogallala basin in the midwest affects everyone in those areas. Farm land reclamation projects in Arizona impact on our Colorado River water treaty with Mexico. And EPA regulations affect us all in various degrees: a number of industrial polluters face shutdown this year. We believe that the Federal Government has a role in helping to solve the problems of meeting water quality standards it imposes. OWRT should be the

lead agency in assisting industry in developing the necessary new technologies.

III. What if OWRT Dies?

Let me first take a narrow, personal viewpoint. In the absence of OWRT support, I believe that two key programs that we have been engaged in at Bend Research may well not survive. One of these deals with a new process that we call coupled transport. It is a process for removing dissolved metals from water and is an extremely promising method for treating electroplating wastewaters and other wastes from the metal finishing industry. A second development that we have undertaken is a new reverse osmosis membrane module that promises to markedly reduce pretreatment costs which are now beginning to dominate water desalting costs. Our small firm lacks the financial capacity to complete the development of either of these exciting new products. We have serious doubts that U.S. industry will pick up these technologies in their generally incomplete state for two reasons: First, U.S. industry is very unaggressive at present because of the high cost of capital; and second, the "not-invented here" philosophy is a powerful and pervasive deterrent.

The implications of the demise of OWRT extend well beyond Bend Research and similar small firms like ours, however. What is at stake, in the long run, is the membrane desalting industry. The U.S. now dominates this field worldwide but we are not without competition. Toray, Toyobo, Teijin and other Japanese firms are moving aggressively into this field. Without some Federal investment in long-range research, we run the risk of losing yet another industry to foreign competition.

On the cover of Newsweek magazine of February 23, 1981 was the bold headline, "Are we Running Out of Water?", and that issue featured a special report entitled, "The Browning of America." Water is vital to every facet of our lives and its importance can only grow as our consumption increases along with our proclivity to pollute. Now is not the time to turn our backs on this national resource. Instead, we should seize the opportunity to establish world leadership in technology for the treatment of impaired waters while maintaining our leadership in water desalting.

I want to thank you for providing me with the opportunity to make my views known. I would be happy to try to answer any questions you may have.

TESTIMONY OF DR. ARTHUR S. OBERMAYER, PRESIDENT

Moleculon Research Corporation

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Cambridge, Massachusetts 02142

HOUSE COMMITTEE ON APPROPRIATIONS
SUBCOMMITTEE ON INTERIOR

Washington, DC

March 23, 1981

I am testifying here today as President of Moleculon Research Corporation, a high technology company in Cambridge Massachusetts, specializing in the chemical and plastic fields. Additionally, I am Vice President of the American Association of Small Research Companies and a member of the National Science Foundation Advisory Panel. Recently I've appeared before the Congress as Chairman of the National Council for Small Business Innovation and as a spokesman from the White House Conference on Small Business. The former organization had as its Honorary Chairman, Bill Casey, President Reagan's Campaign Manager, and my participation in the White House Conference on Small Business was as the representative of Tip O'Niell - so, my support has been bipartisan.

My past testimony before Congressional Committees has been primarily on technology and innovation as it relates to jobs, our economy, national priorities, and options for our country, but this is the first time I have been asked to go beyond the broad policy issues and address a situation that is directly and immediately important to my own business interests. Unfortunately, because my own company will be affected by the planned dissolution of Office of Water Research and Technology, you might feel that my testimony could be biased because of my own vested interests.

However, this is not the case. The planned dissolution runs counter to all of the policy issues I have been supporting for many years. I am deeply concerned with the philosophy that what is good for General Motors is good for the country. The record shows ¹ that big business has been stagnant for many years and new job creation has come almost entirely from small and young companies. In addition, study after study ^{2,3,4} has indicated that an extremely high percentage of the major technological innovations originate from small businesses and individual inventors.

During the past few years the Congress, the past Administration, and the public have become increasingly aware of the importance of technological innovation and how it has shaped and will continue to shape our economy and our

position in world trade. Many hearings ⁵ and panels ⁶ and committees ⁷ have been set up to deal with the problems we face in this area. Yet even though most major innovations come from small business, the government committees are stacked with big business representatives. It was not until a group of small business representatives got together in 1979 that a coherent plan related to the stimulation of small business innovation was formulated ⁸, eventually introduced into the Congress ⁹, and passed unanimously by both the House and Senate Small Business Committees. Two of the four titles of this legislation became laws ^{10,11} in the last Congress, and the other two are being introduced again in the new Congress. The title on Government Procurement was drafted with procedures, approaches and experience of OWRT as a guideline.

The greatest contribution innovative small business can make to our government and the economy is the introduction of new ideas and approaches for products and processes. Most government agencies develop detailed program plans based on their own best judgement, and then ask if anyone wants to bid on their well defined requirements. There is no room for the introduction of creative, new ideas from the outside. OWRT is one of the few agencies that has set up its procurement process to encourage an inflow of innovative

approaches. And just this, I believe, is at the root of its potential demise. These innovative new approaches challenge the established mature and powerful businesses. And, of course, when they are at the top of the heap, they don't want to be displaced.

In a narrower sense, my own company has considered OWRT as an ideal agency to deal with because they have been receptive to new ideas, and we are new idea generators. Our primary thrust is to convert these ideas through technological innovation into commercializable products. As one example, we came up with a new concept for a bound liquid membrane process for removing organic contaminants from industrial wastewater. We carried out extensive market research and evaluation to determine whether an industrial need for this kind of process exists. We found a lot of interest in the pharmaceutical, detergent, synthetic organic chemical, dye and pigment, wood preserving, pulp and paper and plastics industries. The modular approach we were considering could result in significant cost savings and potentially could replace large scale, very expensive pollution control equipment. None of the individual companies approached were willing to invest in the research, development and testing necessary to bring the technology to commercialization. Many industrial organizations were

anxious to see this kind of product on the market, but were reluctant to invest in it. When the funding faucet closed from big industry, we then submitted a proposal to OWRT for funding. They were clearly impressed with our technology and provided funding for laboratory feasibility studies of our Poroplastic membranes for recovery of organic solutes from industrial effluents. We have completed the initial work and we were quite successful in not only working with simulated laboratory effluent, but went beyond the scope of our proposal and carried out successful recovery from real process industrial effluent. Our final report has been submitted to OWRT and we have applied for follow-on funding to demonstrate on-site pilot operation of a prototype membrane system. Now we have commitments from both a small company and a very large company who are willing to have us use their plants for our pilot scale studies. They have reviewed our technology and feel there is an excellent potential for a viable product. Both companies stand ready to provide a full time monitor for the duration of the tests.

I assure you, gentlemen, that the particular dilemma we find ourselves in at the present time is the ever recurring scenario of small business. We have an innovative, high technology product possibility that has already been given a

95% chance of being successful but big business won't touch it until it has successfully undergone pilot scale testing, and big government finds itself facing financial cutbacks due to new administrative recession planning and cannot provide further funding to support the final design/performance stage to bring it to commercialization. It is particularly sad to note that the only serious interest in this product expressed by a large industrial company has emanated from France and not from the United States. I ask you, what would you suggest as our next step?

The decision to eliminate OWRT must be reversed. Failure to do so is symptomatic of a much more serious problem facing our economy. The attitude of big business is, "We made it! We want to make it harder for you to make it! The higher the barriers to potential competitors, the better off we are." This is a fairly standard large business approach. Often it is successful for many years for an individual company, but eventually it is not in the best interests of our economy. Witness: General Motors or U.S. Steel, who have had no small business competitors in the United States but now are losing out to more innovative foreign competitors. Our lawmakers represent all of the citizens, and should have as a goal the improvement of the

economy as a whole. Mature companies in well developed fields will be able to increase their profits in the short run if they do not have to invest in research and development, if their technology is not challenged by small business innovators. But eventually the day of reckoning will come, not only for the fat and happy big business, but also for our entire nation.

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TESTIMONY FOR THE HOUSE OF REPRESENTATIVES
COMMITTEE ON APPROPRIATIONS
SUBCOMMITTEE ON INTERIOR

by Hugo H. Sephton
Envirotech Corporation

Regarding the question whether U. S. industry would sponsor a sufficient R & D effort to introduce new technology into the desalination market should the present OWRT effort be foreclosed by budget cuts:

Based upon a relevant case history discussed below the answer appears to be "no." This depends upon the visible prospects of each technology under question. The real prospects of some newer technologies are presently unknown; the prospects of the novel vertical tube foam evaporation (VTFE) process was unknown in 1973 at the time the OSW budget was much reduced on the premise that distillation R & D had matured and industry would sponsor it henceforth. VTFE, then only a 4-year old distillation technology, was overlooked and industry did not assume the OWRT role.

Fortunately, the Environmental Protection Agency (EPA) responded to our proposals, and has sponsored development of VTFE for industrial wastewater renovation/recycle since 1974. VTFE is presently being demonstrated for the complete desalting of power plant cooling tower blowdown, using waste heat (turbine exhaust steam), with an EPA-sponsored prototype plant shown in the photograph attached. This facility is being field tested at a Southern California Edison power plant site, cosponsored by the OWRT since mid-1980 only; it has now also confirmed the feasibility of using waste heat for desalting seawater at coastal power plant sites, with the VTFE process

at a very low cost. This option should be considered for the OWRT demonstration program. Also germane to the above question and answer, it has been reported that the West German government is presently sponsoring the construction of a large barge-mounted VTFE demonstration plant in Hamburg shipyard.

My Experience in Desalination

I have worked continuously in distillation process development, since 1966 when the Office of Saline Water (OSW) initiated a series of R & D grants in support of several new improvements that I proposed for desalination, including VTFE. This process provides a substantial improvement in the performance of evaporators by imposing a foamy mode of flow upon the liquid being evaporated. It reduces the energy requirements, or the temperature differential needed to cause evaporation, and it increases the rate at which evaporation occurs. Under OWRT sponsorship, we have shown that VTFE would increase the evaporation performance ratio of large multiple effect seawater desalination plants by about 50 percent, and that it substantially reduces the energy required in the vapor compression type of evaporator. (1) Under EPA- and power utility-sponsored projects, we showed that VTFE can be used for industrial wastewater purification and recycle, and also to permit the use of agricultural wastewater for power plant cooling. Current work with the prototype EPA facility shown below has now confirmed that the waste heat (WH) rejected through the cooling towers of a thermal power plant can be utilized by the WH-VTFE to produce distilled water from wastewater, and to simultaneously improve the power turbine efficiency. The VTFE research and development work was done at the Univer-

sity of California Seawater Conversion Laboratory (UC-SWCL) where I had the opportunity and responsibility to develop several related processes during 15 years through 1980. My efforts were sponsored by government and industrial support and were reported in about 40 technical papers on distillation R & D and several potential VTFE applications. This process is now well defined but still requires demonstration before it can be applied industrially with sufficient confidence to attract capital investment. Presently, I am committed to getting VTFE technology accepted in the marketplace, supported by Envirotech Corporation (EVT) as the licensee and sponsor of VTFE. This sponsorship is limited, and success will depend upon acquiring continued government and/or institutional support until a clear demonstration of VTFE is achieved. This applies especially to its application for desalination. We need continued OWRT support to reach this objective.

VTFE, A Promising Technology for OWRT to Demonstrate

1. Multiple Effect VTFE

The merit of VTFE and its potential prospects have been widely recognized, and its development has been deliberate although slower than hoped for. By 1974, sufficient test data had been obtained with OSW-sponsored pilot plants for a Kaiser Engineers' evaluation of the potential of VTFE in relation to the multistage flash evaporation process (MSF). They showed that an MSF plant is about 50 percent more expensive in capital cost than a VTFE plant of the same capacity (2.5 MGD) and that the annual cost of VTFE distillate is lower by 27 percent.⁽¹⁾ They also concluded that a VTFE demonstration plant was

merited and required to confirm commercial viability to introduce the technology to potential users.

2. Waste-Heat VTFE

VTFE development between 1974 and 1980 was sponsored by the EPA and the Electric Power Research Institute (EPRI), and now again by the OWRT and Envirotech. WH-VTFE utilizes power plant waste heat (turbine exhaust steam) to drive the VTFE process while it simultaneously improves the turbine efficiency significantly, saving fuel or providing a net energy gain. It converts power plant wastewater (cooling tower blowdown) into 98 percent of pure distilled water for reuse and a residual solid slurry of only about 2 percent of the volume of the wastewater, to be disposed of by ponding. In a recent study at Bechtel Corporation conducted for the EPA,⁽²⁾ it was shown that WH-VTFE should be more economical for the desalination of cooling tower blowdown than reverse osmosis (RO) or vapor compression vertical tube evaporation (VC-VTE). An earlier Bechtel study⁽³⁾ of fourteen process combinations for cooling tower blowdown renovation/recycle projected that the use of waste heat evaporation integrated with a power plant coolant cycle could provide about a 60 percent reduction in costs compared to conventional procedures. The present demonstration of waste-heat VTFE in California has already shown this to be practically feasible, in recently-completed short-term continuous field testing for 500 hours. Long-term tests now being planned with OWRT co-sponsorship and the present EPA-sponsored demonstration plant shown ought to be pursued to completion. Subsequently, this plant should be operated at a coastal power plant site for a seawater desalting demonstration

with WH-VTFE.

3. VTFE in a Process Combination Permitting Power Plant Cooling with Agricultural Wastewater

Another significant development of an application for VTFE between 1974 and 1978 was co-sponsored by the California Department of Water Resources (DWR), EPRI and three large power utilities. This work successfully developed and field tested a new combination of processes with VTFE that permits the use of agricultural wastewater for power plant cooling, in the San Joaquin Valley.⁽⁴⁾

4. Large-Plant Desalination Demonstration with ME-VTFE and VC-VTFE

Regarding the prospects of VTFE for desalting in more conventional multiple-effect (ME) and vapor compression (VC) type plants, our earlier R & D studies conducted at the UC-SWCL under OSW and EPA sponsorship and published are now being utilized for a large West German government sponsored demonstration plant, while funds are unavailable for our proposal to the OWRT for such a VC-VTFE plant. Our OSW-sponsored publications showed that the application of VTFE in a multi-effect series would improve the economy ratio (or the ratio of distillate product to heating steam) by about 50 percent over that of a conventional VTE plant.^(1,5) We also published comparative test data obtained under an EPA-sponsored project showing that the use of VTFE with vapor compression (VC-VTFE) can provide an immediate energy cost reduction for distillation of seawater by about 30 percent due to a 67 percent enhancement of heat transfer performance by this foamy-flow evaporation technique.⁽⁶⁾ A formal 1980 proposal to OWRT for a design study of a VC-VTFE demonstration plant having a performance ratio of 29 to 31

for the city of Brownsville, Texas, could not be sponsored due to unavailability of funds. The West German VC-VTFE demonstration plant was reported under construction in a Hamburg shipyard for startup this summer; it should confirm our data and show a performance ratio capability of about 30 in comparison with 8 to 15 typical for MSF plants.⁽⁷⁾ U. S. vendors of VTFE equipment may subsequently find it difficult to compete in this area unless we are diligent in the demonstration of this technology. Foreign competition appears to benefit from our efforts as well as from their government support.

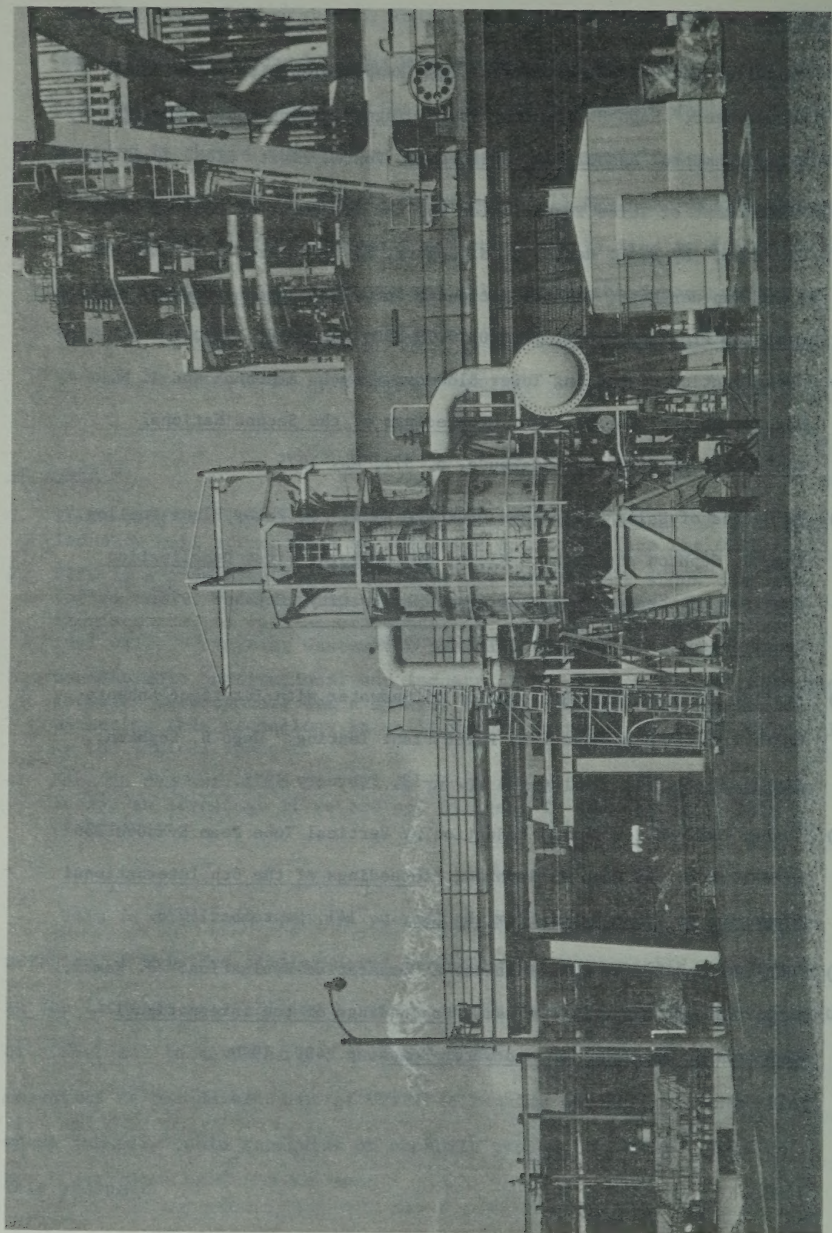
In Summary:

1. It is apparent from our experience with the development of VTFE that industry will not sponsor sufficient R & D to replace the OWRT role.
2. VTFE is a promising new technology; its development shows the need for an OWRT. This desalination method provides high quality water from seawater as well as wastewater; it can also save power plant fuel while converting wastewater into distillate.
3. Considerable institutional and industrial co-sponsorship was obtained for VTFE development, but a sponsor for the demonstration prior to marketing this technology is still needed in the U. S.; the OWRT would be the logical sponsor.
4. Foreign demonstration of VTFE is proceeding; U. S. industry will be losing an advantage if we are not diligent in demonstrating this technology.

This is submitted with the plea that OWRT sponsorship of the demonstration of this and similar novel technologies be permitted to proceed in the interest of realizing a return on the considerable past investments of effort and in taxpayer and industrial funds. Government support was essential in the development of VTFE; it remains necessary to the point where industry could recognize an economic prospect. We are close to this prospect.

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WASTE-HEAT VERTICAL TUBE FOAM EVAPORATION DEMONSTRATION PLANT AT SOUTHERN CALIFORNIA EDISON POWER PLANT

Statement by E. H. Schoonmaker, Director of Marketing, Envirogenics Systems Company, El Monte, California, given before the Subcommittee on Interior Appropriations, United States House of Representatives, at a hearing concerning OWRT on March 23, 1981.

The products designed and marketed by Envirogenics Systems Company are strictly related to water purification equipment and processes including but not limited to desalination. In the desalination field we have established a world-wide reputation as a supplier of both distillation and membrane type desalination plants with at least 95% of our sales originating therefrom. This business, to date, has failed to result in a profitable return for three basic reasons; (i) difficulty in being competitive price-wise with foreign competition; (ii) development of the domestic market to a profitable sales volume base at a much slower rate than has been projected, and (iii) absorbing the continuing burden of research and development expense necessary to maintain at least a reasonably technically competitive capability.

There have been recent public pronouncements, attributed to new administration sources, to the effect that the OWRT is to be completely disbanded and the burden of financing all desalination research and development is to be abandoned by the government to industry on the premise that industry stands to gain the most from it.

In view of these pronouncements, which appear to be substantially accurate statements of the intentions of the new administration, we welcome this opportunity to state our opinion and prediction as to the effect of this ill-conceived action of questionable basis.

A prudent investigation and evaluation of the potential effects of this proposed action on not only the U.S. desalination industry but also on the multiplicity of other clean-water-dependent industries, as well as to the population as a whole would have, in our opinion and that of independent experts in the field, dramatically established that rather than a diminution of OWRT's activities, including research and development, that an expansion

of their charter was a more logical decision in the best interests of the nation as a whole, for the following reasons:

I - U.S. Industry Cannot Absorb all R&D Financing

It would appear that the new administration's proposed action is, at least substantially, based on two premises:

- a) that the desalination business has been profitable for U.S. manufacturers; (the implied assumption being that they therefore have the ability to absorb the total expense of R&D necessary to produce technically and economically feasible desalination processes and equipment which will be required in the 80's and the 90's.)
- b) that the U.S. desalination industry stands to gain most from continued partial financing of desalination research and development by the government.

We submit that both premises a) and b) above are without a basis-in-fact and are grossly misleading.

• With regard to a) above, and based on our own profit experience, which we understand is typical of that of the majority of companies in the U.S. desalination industry (except perhaps for a few which have the benefit of a broader product base and markets unrelated to desalination) we would point out the following:

- (1) a profitable year from desalination sales has yet to be realized;
- (2) profit potential has been materially affected by absorption of company sponsored desalination R&D expense which has been substantially in excess of such financing to us by the government. Following is a tabulation of our water purification R&D expense vs that of the government in recent years:

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Interior Appropriations
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	<u>Company Funded</u>	<u>Government Funded</u>
1976	\$261,000	\$248,600
1977	431,700	132,300
1978	170,000	222,100
1979	378,700	298,200
1980	832,900	149,900
	<u>\$2,074,300</u>	<u>\$1,051,100</u>

We believe that the R&D funding illustration above is representative of that in U.S. desalination companies.

To expect that the industry, in the absence of early profit prospects, can afford to continue such investment and even be expected to expand it just doesn't make good business sense.

With regard to b) above, certainly the U.S. desalination industry could stand to benefit to some degree from government participation in the R&D financing. However, to take the position that the industry stands to gain most in the face of published evidence as to the water crisis which (ignoring the dire needs of much of the world) our nation is facing, and indeed is already starting to experience, is an obvious distortion.

Every major recent forecast on the subject of our national water resources situation is projecting a water crisis of serious proportion in the 80's and 90's.

Indeed, the current water shortage in Northeastern U.S. and also in other areas of the U.S. may well be an early manifestation of such a crisis.

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Meaningful mitigation of the impact of such a crisis cannot be realized through conservation measures alone. A major contribution to solution of the problem must include development of a plan for water reuse which is technically and economically possible. Because of the many variables attendant to the variety of waters to be treated for reuse, a number of purification processes will be required - most of which are categorized as desalination processes. All of the existing such processes require development to optimize water yield, quality and capital and operating cost. To accomplish such optimization within the time frame available dictates an absolute necessity for an accelerated program of R&D on an expanded basis which can only be accomplished by the combined resources of industry and government.

Those who stand to gain the most from continued partial financing of desalination R&D obviously are the majority of the nations population and innumerable other water dependent industries.

OWRT with its background and expertise in this field is, in our opinion the most logical candidate to effectively administer such a plan on behalf of the government.

We thank you for this opportunity to state our position in regard to this serious matter and in an effort to keep this statement as brief as possible have not gone into the reasons we believe has also prevented the desalination business to be profitable to date. However, if case information might be of interest to this Subcommittee, we attach a copy of a statement we presented to the Subcommittee on Water and Power Resources of the Committee on Interior and Insular Affairs on September 30, 1977. The same comments are currently applicable.

Statement by C. F. McArdle, Vice President of Commercial Operations, Envirogenics Systems Company, El Monte, California, given before the Subcommittee on Water and Power Resources/Committee on Interior and Insular Affairs, United States House of Representatives concerning OWRT oversight hearings on September 30, 1977.

The current status of desalination technology being utilized in the world today has directly evolved, over the past fifteen years, from and through the accelerated research and development efforts of U.S. industry together with a very substantial degree of support from the United States Government.

During this period desalination technology was developed from the nature of little more than a scientifically feasible process with limited commercial practicality to its current status as a commercially viable product and industry. This development represents an existing solution to the ever-growing domestic and world-wide shortage of potable water and increasing water related environmental problems.

In recent years, however, the interest and support of the government was substantially curtailed resulting in a significant slow-down in the rate of technology development.

The revived interest, on the part of the government, as exhibited by recently enacted legislation which provides for increased funding to the Office of Water Research and Technology is most welcome, timely and encouraging. It will result in new incentives and basis for increased government/industry cooperative development in some of the areas of the existing technology which require immediate further development to adapt the various desalination processes to current conditions of application and use.

It is suggested that the Committee give appropriate consideration to the following specific areas for immediate development which, it is believed, are necessary in the overall interest and will result in the most productive utilization of the existing and hopefully additional funding.

The primary areas for further development with respect to all desalination processes are those which will:

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- a) reduce the initial cost and quantities required of high value components;
- b) reduce the energy consumption required for plant operation in order to minimize its impact on the cost of water;
- c) develop new generations of key process components which will extend their life and also meet the criteria of a) and b), above.

The primary areas of suggested development noted above are to varying degrees applicable to any of the desalination processes currently considered practical today such as distillation, membrane or freezing processes.

It appears logical, based on current feedwater sources available and practical for high volume desalination, that these suggested areas of development should be applied to the following applications which project the maximum potential benefit and return:

SEAWATER DESALINATION

The usable water demand to meet growing population, agricultural and industry requirements along coastal areas where the most obvious feedwater is the seawater itself, dictates a major effort in further development of those processes which have proven track records with respect to high production capability and reliability.

To date the leading process in this category is unquestionably Multi-stage flash (MSF) distillation. However, the Vertical Tube Evaporator (VTE) process, which has already exhibited advantages over MSF in the areas of energy consumption and simpler operation and maintenance which will result in materially reducing the cost of water production, has been in a stagnant development phase for the past several years because of a lack of government R&D support. It is recommended that the government should re-evaluate the potential of this process as a candidate for further development.

The reverse osmosis (RO) process, one of the membrane processes, has in recent years established itself as the most probable successor to MSF in the future and offers the promise of significant advantages over distillation in many seawater applications. However, there are several aspects of the current RO technology which require additional development to achieve these advantages, such as development of membranes which:

- (1) have improved tolerance to chemicals required to pretreat the seawater;
- (2) are usable under higher temperature feedwater conditions than now possible;
- (3) are usable under lower operating pressure in order to reduce energy requirements and reduce the cost of production of water;
- (4) will permit extended membrane life.

Recent laboratory and pilot plant experiments indicate that all of these developments can be reasonably expected with minor extensions of the current state of the art.

BRACKISH WATER DESALINATION

Membrane processes have proven to be the most practical and economical process for this desalination application which includes processing of large quantities of water each day for municipal and industrial use, to say nothing of the staggering quantities of used water which will require processing for reuse in order to reduce depletion of our water resources. This reuse application with respect to hot waste water also offers, in terms of industrial energy consumption alone, the savings of the equivalence of several hundred million barrels of oil per year.

The same aspects of technology development are required as indicated above with respect to the RO process. However, in addition, research support is required to develop the feedwater pretreatment measures which are the key to successful membrane performance in regard to these applications. Again, laboratory and pilot test results already have established the assurance that the required developments are attainable.

DEMONSTRATION/TESTING

Experience has proven the necessity of proving laboratory results and scaled-down pilot tests on prototype equipment. Therefore, in order to adequately develop and prove the effectiveness of some, and perhaps all, of the above mentioned technical improvement, it will probably be necessary that they be tested at some stage in government seawater and brackish water test facilities.

GOVERNMENT SUPPORT OF INDUSTRY COMMERCIAL EFFORTS

The competitive environment with respect to the U.S. desalination industry in the United States is a satisfactory situation which requires no commercial support on the part of the Government.

The competitive environment in which the U.S. desalination industry finds itself in the foreign marketplace, however, is another story.

The basis for U.S. industry's interest in making its own very substantial investment to develop desalination products, over the past fifteen years, was the anticipation of the development of an early market of considerable volume both domestic and foreign. Unfortunately, the domestic market is taking much longer to develop than anticipated, whereas the foreign market, in recent years, has developed into a high dollar-volume business.

During this period the technology cooperatively developed by U.S. Government and industry was freely disseminated and made available to foreign governments and industry. U.S. industry, as a result, was faced with instant foreign competitors, as the foreign market developed, free-loading on the investment of U.S. Government and industry. As a matter of fact, our government has actually funded millions of dollars to a foreign government to finance development of a distillation process which is now being marketed in the U.S. and for which U.S. industry is required to pay substantial royalties should they desire to make use of the proprietary features developed. It is urged that more restrictive measures should be considered in this regard.

Another area in which the government could assist the competitive position of U.S. industry is in the area of financing of large foreign projects. The financing terms currently available from government sources to U.S. companies is not competitive with the terms foreign bidders can obtain through their government. Also, a significant aspect of many foreign bid and contract requirements is the furnishing of "demand" type bid and performance bonds. Many large U.S. companies have found themselves unable to bid such projects because of the impact on their credit line caused by the issuance of such type bonds. Many foreign governments act as guarantor to their industries in such cases which obviously operates to the competitive disadvantage of the U.S. industries. This latter condition, it should be noted, does not only apply to the desalination industry but has also been a problem to the power generation and allied industries.

This opportunity to constructively contribute to the committee's consideration is sincerely appreciated.

Thank you.



DOW CHEMICAL U.S.A.

March 20, 1981

BARSTOW BUILDING
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MIDLAND, MICHIGAN 48640

The Honorable Sidney R. Yates
Chairman House Committee on Appropriations
Subcommittee on Interior
House of Representatives
Rayburn House Office Building - B308
Washington D. C. 20515

Dear Mr. Yates:

Dow greatly appreciates the opportunity to respond to the questions posed by the House Committee on Appropriations, Subcommittee on Interior.

What will Dow do if the Office of Water Research and Technology stops funding desalination research and development?

Will Dow continue to internally fund desalination research and development?

Will Dow remain in the business of marketing hollow fiber membranes for reverse osmosis?

The position of The Dow Chemical Company is as follows:

1. We completely support President Reagan's policies to reduce government spending, minimize federal regulatory influence and create an economic environment which will enhance the competitive ability of American business.
2. Our involvement with the water treatment business goes back to the early 1940's when we pioneered use of ion exchange resins to demineralize water. We have long provided products for disinfection, flocculation, clarification, neutralization and purification. We introduced the first hollow fiber membranes for reverse osmosis in 1958. We have had a successful contracting relationship with OWRT for over 20 years, including operation of a distillation desalination plant in Freeport, Texas. Subsequent research contracts have been a significant part of our commercial development programs with ion exchange resins and membranes for reverse osmosis.

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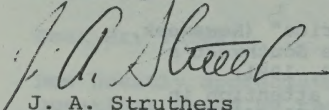
3. We expect existing OWRT research and development contract commitments to be honored and completed.
4. In the event that OWRT funding is eliminated, Dow will fund with its own money a \$319,301 contract for new membranes which has been in negotiation with OWRT since January 1980.
5. Dow will remain in the commercial business of supplying hollow fiber membrane permeators for reverse osmosis desalination.
6. The articles "The Browning of America" (Newsweek, February 23, 1981) and "Ending the Southwest's Water Binge" (Fortune, February 23, 1981) (copies attached) correctly focus attention in layman's terms on "water" as a rapidly developing national problem which may soon equal or exceed the crisis proportions reached by oil.
7. "Water" is truly a national issue, and with all the attendant social, economic and political problems, it will require some form of industry-federal/state government cooperation to effectively solve problems.
8. The current maze of laws, regulations, agencies and jurisdictions constitutes a very fragmented and disjointed water policy which does not provide adequate incentive for American industry to invest sufficiently to solve problems and maintain competitive advantage in global markets.
9. For example, it might make sense for industry to fund the existing OWRT test sites at Roswell, New Mexico, and Wrightsville Beach, North Carolina, with government coordination of operations. A cooperative approach to water reuse technology might also be in order.
10. We suggest that possibly the fate of OWRT should be linked with future federal/state policies on water and the resulting environment within which new technology will be developed and within which American business must perform.
11. We believe a sense of urgency must be associated with government-industry attention to water. Dow would welcome the establishment of an economically sound

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federal/state water policy which simultaneously allows water to be valued at its true value and stimulates research and development to develop and prove technology to solve water problems. This would achieve both conservation and efficient reuse of water.

Thank you for the opportunity to participate in this hearing.

Sincerely,



J. A. Struthers
 General Manager
 Hollow Fiber Membranes

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Attachments

TUESDAY, MARCH 24, 1981.

NATIONAL ENDOWMENT FOR THE HUMANITIES

PUBLIC WITNESSES

OPENING REMARKS

Mr. YATES. This is the beginning of the hearing on the appropriation for fiscal year 1982 for the National Endowment for the Arts and the Humanities.

Our committee is continuing a practice begun last year of having public witnesses testify about the programs of the endowments and their views on the programs of the endowments and their importance prior to the time that the endowments themselves appear before our committee in support of their appropriations.

There has been a great and significant outpouring of support for both endowments. Ever since their establishment in 1965 the endowments have received bipartisan support of the Congress and presidents.

Since they were established in 1965, Presidents Johnson, Nixon, Ford, and Carter, all of whom had radically differing philosophies on the purpose and function of government, recognized that a proper responsibility of the national government is the encouragement and enrichment of the human mind and spirit and that creativity in our people is a thing to be celebrated and cherished.

In support of those views, each year increases were requested by the presidents for the appropriations of the endowments. This year we face a different situation. We face a budget recommendation by President Reagan proposing reductions of 50 percent in the budgets of both endowments, the Endowment for the Arts and the Endowment for the Humanities.

From what I can gather from newspaper and budget document statements by the President and by Mr. Stockman of OMB, the reduction is premised on two postulates. First, that the growth of Federal support has resulted in a reduction of the historic role of the private individual and corporate support in the arts and humanities.

Secondly, this statement appeared in the so-called black book of Mr. Stockman: Funding for artistic and literary pursuits is a relatively low priority budget item.

May I say that this attitude is unique among recent presidents, beginning with a statement that I found in a speech by John F. Kennedy in 1962. The attitude of the presidents has been to the contrary.

Mr. Kennedy said in 1962: "A Nation's government can expect to play only an indirect and marginal role in the arts." I include the humanities and I am sure he did too [reading:]

Government's essential job, the organization and administration of great affairs, is too gross and unwieldy for the management of individual genius but this does not mean that government is not, or should not be, concerned with the arts.

Free government is the reflection of people's will and desire and ultimately of their taste. It is also, at its best, a leading force, an example, and a teacher.

I would like to see everything government does in the course of its activities marked by high quality. I would like to see the works of government represent the

best our artists, designers, and builders can achieve. I want to make sure that policies of government do not indirectly or unnecessarily put barriers in the way of the full expression of America's creative genius.

The arts in the United States, like so many other activities—varied and decentralized to a high degree private benefactors, foundations, schools and colleges, business corporations, the local community, the city and the state—combine in widely differing proportions to organize and support the institutions of culture.

I would hope that in the years ahead, as our cultural life develops and takes on new forms, the Federal Government would be prepared to play its proper role in encouraging cultural activities throughout the nation.

We are going to hear from very distinguished witnesses today.

There is one statement that I like to repeat. I have repeated it, I believe, in every hearing on the appropriations for the humanities. The statement appeared in the report of the Commission on the Humanities in 1964. This was the report that led to the creation by the Congress of the endowments. The Commission on the Humanities said this:

Traditionally, our government has entered areas where there were overt difficulties or where an opportunity had opened for exceptional achievement. The humanities fit both categories for the potential achievements are enormous, while the troubles stemming from inadequate support are comparably great.

The problems are of nationwide scope and interest. Upon the humanities depend the national scope and interest. Upon the humanities depend the national ethic and morality, the national esthetic and beauty or the lack of it, and the national use of our environment and our material accomplishments.

Each of these areas directly affects each of us as individuals. On our knowledge of men, their past or their present, depends our ability to make judgments, not the least of which are those involving our control of nature or ourselves or our destinies.

Is it not in the national interest that these judgments be strong and good.

Reading from a report for the year 1977 of the Arts Council of Great Britain, I noticed a paragraph in the report of the Secretary General in which he said:

It is often said that in time of financial difficulties, the arts cannot expect to be exempted from cuts, especially when essential services, such as schools and hospitals suffer them.

This way of putting it implies that the arts are not an essential service but a luxury. Most people, however, would agree that life is more than livelihood and the arts provide an essential service to the community by helping make our life worth living.

WITNESS

HOWARD W. JOHNSON, CHAIRMAN OF THE CORPORATION, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Mr. YATES. Our first witness today is the Chairman of the Board of MIT, a very distinguished gentleman in his own right. He is distinguished for a biography that may go into the record.

I am delighted to note from that biography that he is a fellow alumnus of the University of Chicago, having graduated there a number of years ago, following my graduation from that school.

Mr. Johnson, the committee is very glad to have you initiate this hearing. We will be delighted to hear what you have to say. Your statement may be made a part of the record.

Mr. JOHNSON. Thank you very much.

I am Howard W. Johnson, Chairman of the Corporation of MIT. I have served as President of that institution. I am also currently a

Director of Federated Department Stores, the John Hancock Mutual Life Insurance Company, Champion International Corporation, J. P. Morgan and Company, and E. I. du Pont de Nemours and Company.

I have served in the past as Chairman of the Federal Reserve Bank of Boston but have spent most of my life in the world of education. Like many of my predecessors at MIT, Mr. Chairman, I have not confined my civic and voluntary activities to the realms of science and business. I have been President of the Museum of Fine Arts of Boston and a Trustee of the Aspen Institute for Humanistic Studies, the WGBH Educational Foundation, and an Overseer of the Boston Symphony, among others.

In these brief comments, I am very conscious, also, of the special attention MIT has given in recent decades to the humanities and to their interconnections with science and technology. That development has had my strongest interest.

Mr. Chairman and members of the committee, I strongly oppose the recommendations of the Office of Management and Budget for the National Endowment for the Humanities and the Endowment for the Arts for fiscal 1982 and the projections suggested through 1984.

In doing so, I would like to make it clear that we seek no special privilege nor place for the humanities and the arts. I do not regard these domains nor any department or agency of the government as sacrosanct or immune from the President's economic goals.

Moreover, given that my own principal responsibilities lie in areas other than the humanities and the arts, at least on the surface, I hope that you will understand that my opposition to the proposed budget does not arise from any narrow interest.

Rather, I was moved to come here today as the committee begins its deliberations, first, for the National Endowment of the Humanities and then for the National Endowment of the Arts, out of a broader conviction about the importance of the humanities to our people and to American society.

I am moved and dismayed by the inequity of the budget cut burden proposed for the National Endowments. As you well know, OMB does not propose that the humanities and the arts share on an equal or level basis with other areas of Federal activity in its program to trim many billions of dollars from the government's 1982 expenditures. It proposes instead that funds for these two agencies, the NEH and the NEA, be cut approximately 50 percent.

As a purely practical matter of permitting the endowments to function effectively, such a budget cut is a devastating blow that must be of great concern to the subcommittee. But of even greater concern are the policy implications of the OMB proposal that would reduce and remove Federal involvement in the humanities and the arts. This proposal is, in fact, a serious retrogressive step in public policy and a reversal of the intent of Congress as expressed in the Act of 1965 establishing the National Endowments for the Arts and the Humanities. I believe it requires a serious review of the public-private balance in these areas.

Sixteen years ago, there may have been private patrons and corporate executives who were opposed to Federal involvement in the arts and humanities. Today I, and most of my peers among corporate directors, would not like to see higher education, scholarly research, and the creative and performing arts dependent upon government, as in many countries they are.

The pluralism and diversity by which the American people express their social, educational, intellectual, and esthetic goals are basic to the kind of society we have. Just as basic is the goal of maintaining the independence of the rich array of cultural institutions.

In these observations, I am touching, of course, on one of the central concerns about Federal support of the humanities and the arts. That is fear of subsequent Federal regulation in the event of Federal budget support.

I have had a fair amount of experience in these areas in the field of science. While one can always cite some troubling examples of government intrusion, that has not been borne out in any general way, especially in our experience with the national endowments.

They have function, rather, in a collaborative partnership with individual, foundation, and corporate philanthropy. This partnership, over a remarkably short historical period, has proven itself amply. It is certainly above class or political controversy.

You mentioned, Mr. Chairman, the political base of the establishment of the humanities. I think it is important because it reflects our culture.

Established under President Johnson, the National Endowments for the Arts and the Humanities matured under Presidents Nixon and Ford, attaining a level which was further supported by President Carter. It has not dampened but stimulated private patronage, which far exceeds all other sources together. Its existence has coincided with higher levels of corporate philanthropy in these fields, and that is not accident.

The OMB assertion that "the Federal Government has been relied upon increasingly as the financial patron of first resort for both individuals and institutions engaged in artistic and literary pursuits" simply does not correspond with the facts as I know them.

In the last figures that I have seen published, a total of nearly \$2.5 billion was contributed from all sources to arts and humanities. Fifteen percent was attributed to State and Federal agencies. Ten percent was attributed to corporations and 7 percent to foundations. Nearly 70 percent, or \$1.66 billion, came from individual gifts.

The National Endowment for the Humanities budget request for fiscal 1981 is \$169 million. One can compare that to the total of \$2.5 billion contributed from all sources in the last year in which I have seen full numbers.

The growth in financial support from business and industry, you will want to note, has been attributed by both the corporate community and the cultural organizations to the catalytic nature of the NEH and NEA grants. To reduce these Federal budgets drastically with the thought that corporate funds will then flow in to replace them is, in my judgment, an unlikely and forlorn hope.

Grants from the endowments do play a very special initiating role in providing seed money for important projects which are financed, in the main, from private sources. Without this seed money, the following funds from other sources would dry up. I say this based on my own experience in raising support for cultural institutions.

Further, through Treasury funds and Challenge Grant programs—both forms of matching support, as you know—the endowments especially help institutions generate project and long-term general support from non-Federal sources.

I would argue that grants from the NEA and the NEH stimulate, not replace, private support. This can be, and has been, demonstrated over and over in many institutions across the country. The principle is demonstrated by the recent building program of the Boston Museum of Fine Arts, to cite one example with which I was directly involved.

It was begun in 1975 and was initiated only after a \$2 million Challenge Grant, in this case from the National Endowment for the Arts. This NEA award was crucial to the success of the Museum's drive. Out of that initial \$2 million Challenge Grant, in fact, that drive has now raised \$21.5 million for the project. The arts museum function in New England as a result has been greatly strengthened for the next generations.

Time and time again, the Federal partnership has helped direct individual, corporate, and foundation support toward particular and important beneficiaries.

All of this activity, quite naturally, has further beneficial economic impact. In New England, which is the region I know best, there are nearly 3,000 cultural organizations and 20,000 artists. This aggregation of cultural activity, according to the latest available data, provides 43,000 full and part-time jobs to New England residents and generates, in salaries, purchases, and related expenditures, well over half a billion dollars for the New England economy as a whole. That is the economic benefit in just our one small region.

Besides dampening these economic benefits, the current budgetary proposals from the Administration come upon the institutions and groups in the humanities and the arts at a time when the inflation of costs, as in any labor-intensive enterprise, threatens the stability of all and the very survival of some.

This effect is, of course, not at all limited to museums, libraries, colleges, and performing arts institutions. But the balance and interconnections of government, individual, foundation, and corporate support of non-profit activities in the humanities and the arts is as delicate as it is new. The cutting of one segment in this mix could, and I believe would, have important and negative, not positive, influences on the others.

Between 1970 and 1980, even in proportion to expenditures, private support has increased. This pattern bids fair to continue. But it is unreasonable, as I have already suggested, to expect that on top of that individual and corporate patrons would turn around and replace the shortfall in Federal funds. They may try but they cannot succeed, especially in the short run.

As for the State government programs, the press has already covered estateively the ripple effects from Federal cutbacks in many programs.

The negative impact of the shortfall will be especially heavy on scholars in the humanities. According to a recent summary by the Association of American Universities, to which MIT belongs, the NEH is the principal source of fellowship support for work on independent research projects. Approximately 600 fellowships and summer stipends, totaling \$7.7 million, will be awarded by NEH in 1981, the current year. In all, the NEH will make grants totaling \$18 million in 1981, to assist approximately 6,500 scholars working on long-term collaborative research [reading]:

In addition to funding large-scale, multi-year research projects, the NEH also provides substantial assistance for library and archival projects for cataloguing, conservation, and preservation.

During the current year, the Endowment will award more than \$16 million for curricular projects and for the development of exemplary teaching materials.

This is spread in productive amounts across the entire country.

Let me say a word about the fundamental ways in which the support by the NEH has been so vital to our country. We are strong as a country but basic to many of our strengths lies our deepening understanding of our culture, our society, our tradition, our humanity if you will. Essential to this understanding are elements of language and literature and of philosophy, archaeology, cultural anthropology, religion, history, the humanistic aspects of political science and psychology, the history, theory and criticism of the arts.

These, I suppose, are what the educator thinks of first when the humanities are to be placed institutionally. But only structurally.

The tools of humanistic scholarship are time, meaning fellowships; place, meaning libraries, archives, museums, collections, and artifacts from the past; publications, all the way from computerized or hand indices to journals, monographs, books, and large corpus editions of particular papers or studies in a given field.

I am going to file, if I may with my testimony, an addendum on how that has affected some individual scholars.

Mr. YATES. That may be admitted to the record.

[The information follows:]

ADDENDUM

The work of the NEH can be illustrated with examples. Let me cite one which I happen to know firsthand.

Judith Martin, a National Merit Scholar and the first Black valedictorian of Bay City High School on the Texas Gulf Coast, enrolled at M.I.T. and graduated last June with two S.B. degrees—one in Biology and the other in Humanities and Science—and an acceptance to medical school. But last year, despite her heavy schedule, she decided to do an independent project, based on her interviews with elderly Blacks back home, and this became her senior thesis: "A Collection of Short Stories Based on Post-Slavery Life in Matagorda County, Texas."

Her professor of writing in M.I.T.'s Department of Humanities saw that Ms. Martin had the potential to put together a first-rate collection of publishable stories based upon the folklore she had gathered in her hometown. And he encouraged her toward this goal. As a result, Ms. Martin for this past year has taken a brief detour on her career path, that has led her away for a short time from the world of medicine, which she will re-enter next fall. It is a journey that, in time, has taken her back over four generations into the era before the Civil War when her own ancestors were slaves.

What Ms. Martin has done has been to interview elderly Black residents of the Matagorda County region—many of them her relatives, including her grandmother—to take down their reminiscences and to record stories that have been passed down from generation to generation. Many of these people were elderly—80 years of age and older—and they had parents or grandparents who were slaves. Her completed stories are “fictionalized accounts based on folklore” of what life was like at that time, particularly just after the Civil War and at the end of slavery.

In April, one of the stories will be presented in dramatic form at a Black folklore festival in Bay City, where Ms. Martin's father is a Baptist minister and an elementary school principal and her mother is a teacher. And all of this project has been made possible through a Humanist-in-Residence Grant sponsored by the Texas Committee for the Humanities and the National Endowment for the Humanities.

Mr. JOHNSON. They include, also, clusters, teams, or centers of scholars, bringing together their specialized information and skills to increase their knowledge in particular areas.

Since World War II, it should be noted, government and industry, in addition to higher education, have profited immensely from interdisciplinary area studies, first conceived by the American Council of Learned Societies as an aid to the worldwide war effort, as was also the U.S. Army language training program which led to our audio-lingual method of teaching.

When the Congress created the National Endowment for the Humanities in 1965, there was much private philanthropic experience from which NEH's principal mission could be derived. This experience had quite recently been the basis of a report by a National Commission on the Humanities, sponsored by the American Council of Learned Societies, Phi Beta Kappa, and the Association of Graduate Schools.

The policies of the NEH for the support of humanistic scholarship, in the views of my colleagues in those fields, have been clear, easily defined, and consistent with the traditions of private philanthropy in the humanities.

All the tools of humanistic research I have enumerated—fellowships, libraries, archives, museums, collections, and artifacts from the past—have been touched by the Endowment's programs, often influenced by gaps in the programs of other Federal agencies.

The public programs in the humanities with which I have any familiarity have been the partial support of exhibitions in museums of art, science, and history and historical and cultural programs on public television. I can tell you that they reach from these platforms into the schools and homes of our young people in positive ways.

I am not here to evaluate, and could not, the priorities of the Endowment's program at its current budget level, approximating \$150 million, or at any other level. That is not my competence.

But as one citizen, I should like to affirm my conviction that the importance of the humanities transcends their narrow structure and use in only the higher educational system. They have to do not only with thinking and analysis but with a way of thinking.

Our whole society was symbolized in a way in its maturity by the Act of Congress in 1965. Federal partnership in the support of the humanities is not now less important but more important, especially when we look at some of the disarray in the education of our citizens, particularly at the elementary and secondary levels.

It is my hope that your committee and the Congress as a whole will give earnest consideration to the National Endowments for the

Arts and the Humanities among the important priorities in our national life and so seek to guard them and support them.

Mr. Chairman, that is my general statement. I thank you for the privilege of appearing before you.

Mr. YATES. We are grateful for a very fine statement, Mr. Johnson.

In 1960, an advisory committee to President Eisenhower made a report to the president. It is particularly fitting that I call it to your attention, inasmuch as you are chairman of the Massachusetts Institute of Technology, a university which was originally created for the purpose of exploring science and engineering.

At that time the committee reported, obviously [reading].

A high civilization must not limit its efforts to science alone. Even in the interest of science itself, it is essential to give full value and support to the other great branches of man's artistic, literary, and scholarly activity. The advancement of science must not be accomplished by the impoverishment of anything else. The life of the mind in our society has needs which are not limited by the particular concerns which belong to this committee in this report.

I assume you would agree with this statement.

Mr. JOHNSON. Yes. I believe strongly, from what I have seen over the last 35 years, that excellence in science has to be accompanied and interworked with excellence in humanities. The one without the other, in our kind of society, is ineffective.

Mr. YATES. Are there any questions?

[No response.]

Thank you very much, Mr. Johnson. We appreciate it.

Our next witness is Barbara Tuchman. We are very pleased to have you here again. We were delighted when you came last year to give us the benefit of your wisdom.

I was particularly delighted two nights ago to have the pleasure of sitting next to Ms. Tuchman at dinner. She told me she was engaged in pursuing a monograph which she had written some time ago, entitled *An Inquiry Into the Persistence of Unwisdom in Government*.

I thought that might be singularly appropriate today.

WITNESS

BARBARA TUCHMAN, AUTHOR

Mr. YATES. We welcome you, Ms. Tuchman, and your statement may be made a part of the record.

[The statement follows:]

STATEMENT OF BARBARA W. TUCHMAN

While I agree with the necessity of reducing federal spending, I believe a wise judgment of priorities is essential. The reductions which this administration has proposed in federal support for the humanities are, to my mind, too drastic. They say that our government should give low priority to the humanities. I believe that, far from being a kind of expendable ornament, the humanities are central to our society and that the federal government should give high priority to their support.

Because they have been so essential to me in my own research, I am particularly well acquainted with the resources of our country's research libraries. The maintenance, preservation, continued collection, and availability to scholars and the public of the records of civilization kept in these libraries is essential to the national interest and the cultural development of our people. Without funding from the National Endowment for the Humanities precious documents will deteriorate, hours will be

curtailed, and newly-acquired materials will remain unprocessed and therefore inaccessible.

I am especially anxious that you know that most funding to research libraries from the NEH is in the form of Challenge Grants which stimulate private giving of more than double the federal contribution. In the case with which I am the most familiar, that of the New York Public Library, the challenge of matching the NEH grants has resulted in an outpouring of private philanthropy. In the year before the first NEH matching grant, the Library received only \$600,000 in private contributions. In 1979, in response to the challenge of federal funding, the Library raised \$9 million dollars. This extraordinary success story has been duplicated on a smaller scale at institutions such as the American Antiquarian Society and the Newberry Library.

I know that this administration believes fervently in the ability of the private sector to provide support for the humanities. Because the size in dollars of the grants to libraries is not often large, I do not doubt that enough private resources exist to fill the holes which would be left by withdrawal of NEH funding. But I seriously question whether, in the absence of federal stimulus, those dollars will be forthcoming. With resources that are so centrally in the national interest, so much a part of the fabric of our civilization, does not the government have a role to play? Why should private donors step forward when their own government is unwilling to make even a small commitment?

I urge you to support continued funding of the NEH at present levels, especially for preservation of its Challenge Grants and other programs which encourage partnership with the private sector.

Ms. TUCHMAN. Thank you, Chairman Yates.

I should introduce myself; I am a writer.

Mr. YATES. That is the understatement of the year.

Ms. TUCHMAN. If I may be allowed to vary a little from my prearranged statement, I will. Mr. Johnson has covered everything with such impact and power that I don't want to repeat much of what he said.

I came here, agreeing with the impulse of the new Administration to reduce the waste and fat in Federal spending. I believe it is a necessary objective.

But I think, too, it must be followed by a wise judgment of priorities, as Mr. Johnson has already pointed out.

Everyone today is talking and worrying and is concerned about national security. I asked myself what is national security. If you want to put it succinctly, it is strength, disposable strength.

I think that strength in a nation, as in a person, cannot be disposed or used without internal help. I think the society has to be internally healthy in order to be strong.

I know that Thomas Jefferson, who perhaps was the most complete humanist of our history, believed that knowledge was strength. Knowledge has to be. It doesn't descend from on high. It has to be promoted and pursued and supported.

I believe that is the function of the National Endowment for the Humanities. That is why, it seems to me, its support is one of our major priorities.

In my own work, I benefit enormously from the use of libraries so my concern is very directly with libraries. I know from being on the board of the New York Public, which is one of the five great libraries of the world, how stringent their financial situation is and how much it has benefited from NEH Challenge Grants which have literally saved its holdings in many ways by stimulating private philanthropy.

The most important thing in libraries is, first, access by the public and, second, preservation of the holdings which in our time,

as you all know, is suffering from deterioration and decay and actual disintegration.

Without very strongly supported programs of conservation, many records of our civilization simply disappear. There is not enough financial funding present to hold this process back.

Simply for survival, the funding that the NEH has stimulated is essential for the preservation of the holdings of the libraries. Access is equally dependent because hours have had to be reduced, because the money for the staff has dwindled.

In addition, newly acquired materials will remain unprocessed and, therefore, inaccessible. In many cases, it will be uncollected; that is, it cannot be acquired through lack of funds.

I am especially anxious that you know that most funding to research libraries from NEH is in the form of Challenge Grants which stimulate private giving of more than double—in fact, three to one, I believe—Federal contribution.

Mr. Johnson has already pointed out how important this stimulus to private giving has been. This is exactly what President Reagan says he wanted to see happen. To cut off the source of the stimulus seems to me counterproductive, to put it politely.

In the New York Public Library, the year before the first endowment matching grant, the library received only \$600,000 in private contributions. In 1979, this has been raised in response to the Challenge Grants to \$9 million.

This extraordinary success story has been duplicated on a small-scale in other libraries, such as the Newberry in Chicago.

I know that this Administration believes fervently in the ability of the private sector to provide support for the humanities. Because of the size in dollars of these grants is not often large, I do not doubt that enough private resources do exist to fill the holes which would be left by withdrawal of NEH funding.

But would they be forthcoming without that challenge and without that stimulus.

This has given an enormous boost in enthusiasm and confidence to many institutions and to their prospective donors.

There is something about the government showing its belief in the importance of our cultural institutions that stimulates not only individual donors but to frequently short-sighted and selfish corporations.

The world "challenge" really works. I think when Federal money is allocated to these institutions, corporations begin to feel they must respond. And they do. I think this has been an enormous step forward in American life.

For centuries the European countries, like England and France, which perhaps I know best, have supported their cultural institutions. It is not a recent thing over there. The Comedie Francaise has always been funded by the government. The parks, Regence Park in London and the Tuilleries in Paris—flowers and things that make public beauty—are supported by the government. The tulip beds are planted by the government.

The tradition of Federal or government support for arts and education and municipal beauty is a very old one over there. We are only recently learning it. It seems to me that the creation of the two endowments 15 years ago was a very encouraging and

handsome thing in American life. It was one of the things, in my opinion, that makes for national pride, self confidence and strength. which, goodness knows, as everybody tells us, in this era of America's decay we badly need.

That is why I hope that this funding, which is up for consideration, will be continued at its present level.

Mr. YATES. Thank you, Ms. Tuchman, for a very fine statement.

I should have given you the recognition which you have earned so well. I should have said for the record that you are the President of the American Academy of Arts and Sciences.

Ms. TUCHMAN. Arts and Letters. I have resigned from the other one.

Mr. YATES. Academy of Arts and Letters.

You won the Academy's gold medal in 1978 for history. You were the Jefferson Lecturer in the Humanities in 1980. And a very good lecture it was indeed.

Thank you very much.

WITNESS

OSSIE DAVIS, ACTOR AND WRITER

Mr. YATES. Mr. Ossie Davis is our next witness. We welcome you to the committee. Mr. Davis is an author and actor and playwright. He is a civil rights activist. He has had starring roles in "Raisin in the Sun" and "Purlie Victorious," which he wrote. He has written a number of books and has been an active participant in the Hospital Workers' District 1199 "Bread and Roses" program.

With that background, and other incidents too numerous to mention, Mr. Davis we are glad to hear from you.

Mr. DAVIS. Thank you for your kindness, Congressman Yates.

I am happy to be here on this occasion. Let me begin by saying that I subscribe wholeheartedly to the statement made by Mr. Howard Johnson. It was heartwarming and educational. Nothing I could say would add to its agency.

I prefer to speak in my own person about things that concern me—I suppose, directly and personally.

I am Ossie Davis, actor, writer, director, husband, and father. Like many another poor black and working class American, I have been able to pull myself up into the American mainstream by my bootstraps. But it was only because the Federal Government helped to provide me with the boots.

I was raised in the midst of the Depression. I left home walking to get to Washington, D.C. so that I might possibly become a student at Howard University.

I remember a stipend provided by my family at that time. This was in 1935. It was in the total amount of \$10. It could neither buy me transportation nor entry into Howard University. Still, I was able to secure an National Youth Administration scholarship. To that governmental institution I owe much.

With the scholarship I was able to attend Howard University, which was then and is now the beneficiary of Federal intervention. I am a product of that institution.

I come before your committee as a beneficiary. I am a writer and on more than one occasion I have been able as a writer to rely on research that was previously done and housed in libraries. The New York Public Library on Fifth Avenue and 42nd Street was one place I was able to go and get information which enabled me to write a play about Burke Williams. I was able, also, as a writer to rely on the help of the Chamberg collection, which has been supported by the National Endowment, and wrote a work on the youth of Frederick Douglass.

I come before you also as a worker. I was happy to be involved with District 1199, Drug and Hospital Workers Union, when they embarked on what I thought was a landmark corner-turning activity. This union, which is well-known for its care and concern for all the aspects of the life of its workers, has never hesitated to try and provide its workers not only with the bread and the substance by which we live—the wages and working conditions—but also to claim that workers had a right to roses as well as bread and that culture in a democratic society should belong by rights to all of us, not to an elite class or to those who are privileged or to those who have nothing else to do with their time but to the very working people themselves.

Bread and Roses was one of the instances in which we were able to talk to the workers themselves, to listen to what they had to say, to take their conversations and make them into songs and dances and skits and then to go to where the workers worked and during their lunch hour to perform for them and play back to them their experiences in artistic form.

I have never been prouder of an artistic endeavor than I was of this particular activity. We maintained the highest quality as writers and as performers. We were able, I think, to convince our fellow workers that our lives and the substance thereof were as precious and as worthy of note as the kinds of life and lifestyles we see portrayed in motion pictures on Broadway and on television.

I think it was a step in upgrading the quality of the life of the American worker, and the American worker is the backbone of our society.

I come before you also as an Afro-American. My history is my identity, and much of this history and that identity still remains hidden, awaiting scholarly research, such as that which led Alex Haley to provide or reestablish an umbilical connection between those of us who have come to America by whatever means and the Fatherland back in Africa.

This endeavor alone drew the attention of more television viewers than any other work up to that time. There is a tremendous hunger among the broad masses of American society for the facts of America and the truth of our experience—not only the experience of Afro-Americans but all of us, except those who were here when Columbus came—bringing with us our history, our culture, and the things which made us proud to be what we were.

Scholarship has a great job ahead of it to help unearth and reconstitute and restore to the various ethnic groups in American society those things of which we should be individually, ethnically, and collectively, proud.

I come also as a citizen. A little glamor is attached to that designation. I am almost embarrassed, certainly self-conscious, to describe myself as a citizen, remembering what Mr. Johnson said about patriotism, holding it out as the last refuge of a scoundrel.

People who claim too loudly their citizenship are always suspect.

Certainly in my profession a little glamor attaches to voting and walking a picket line, going to church on Sunday, or writing a letter to your congressman and joining up with the PTA.

Still, what is being proposed in the threat to cut the budget of this and other important institutions has made me dare to come out of the closet with my citizenship and to dare to say aloud that I am, indeed, a citizen and proud of it.

I think Mr. Lincoln spelled it out clearly for all of us when he spoke of that government of the people, by the people, and for the people. I admit that I am what Mr. Lincoln was talking about. I am, God help me, a people.

A serious part of my responsibility as a people is to give guidance to that government which can legally represent me only with my consent.

Speaking in all of these various voices, I implore this committee to exercise its full powers and all of its consideration to try and impress upon our government the importance of maintaining the highest level of scholarly activity in American society.

I beg you, sir, not to ask only that the proposed budget cuts be restored but in light of the responsibility that we face as a country that has not yet defined its own version of itself, I suggest that we need to tell our government that the funding should be augmented.

Mr. Stockman, in his powers, is not altogether unlike Solomon at the time he was approached by the two mothers claiming the same baby. Let us hope that this committee will help Mr. Stockman as he swings his axe to be as wise.

I thank you.

Mr. YATES. Thank you for a very profound statement.

WITNESS

LIEUTENANT GENERAL JAMES M. GAVIN, USA RETIRED, FORMER AMBASSADOR TO FRANCE AND FORMER CHAIRMAN OF THE BOARD OF ARTHUR D. LITTLE, INC.

Mr. YATES. Our next witness is General Gavin.

I think you are probably one of the reasons that we have this interest in the humanities, and history is a part of it.

My two young colleagues on my left from the great Northwest I am not sure remember General Gavin. I am old enough to remember him as one of the great soldiers of World War II—not only as a great man in the war but also as a man of peace, subsequently, as our Ambassador to France.

I think it is singularly fitting, therefore, to have you as a witness at a time when emphasis seems to be shifting so very much in our national budget to the weapons of war. We do have the need for a strong defense establishment. I think that's obvious.

It seems to me here ought to be room for a nation that is not at war for the pursuits that will bring peace. You have participated in both, and we are delighted to welcome you to this committee. Your statement may be made a part of the record.

[The statement follows.]

Your statement may be made a part of the record.
[The statement follows:]

House Committee on Appropriations: Subcommittee on Interior and Related Agencies

Testimony of Lieutenant General James M. Gavin, USA Retired, former
Ambassador to France, and former Chairman of the Board of
Arthur D. Little, Inc.

March 24, 1981

Mr. Chairman:

I am James M. Gavin, Lieutenant General, U.S. Army Retired, former Ambassador to France, and, until recently, Chairman of the Board of Arthur D. Little, Incorporated of Boston, Massachusetts.

I am here as a concerned citizen and as a spokesman for an alliance of associations and individuals bound together by the conviction that a democracy such as ours must promote knowledge in the humanities as well as in the sciences. My life-time of public service at home and abroad, in peace and in war, has given me unusual opportunities to observe and understand of what great value learning in the humanities -- especially learning in foreign languages and cultures -- is to our nation and to the maintenance and defense of its principles and interests.

In 1979, the President's Commission on Foreign Language and International Studies, under the chairmanship of Dr. James Perkins, expressed dismay that so few Americans could communicate in a language other than English and that knowledge of other cultures and understanding of the policies and interests of other nations were seriously deficient. The Commission report concluded that these conditions constituted a threat to the national economy and, indeed, to national security. For instance, the Report states that, by a reliable estimate, 10,000 Japanese business representatives who speak English are working in the United States. In Japan, there are fewer than 900 American business representatives and only a handful of them command a working knowledge of Japanese. Not only the conduct of business but the conduct of diplomacy depends upon effective communication between us and other nations and peoples. Although English is widely spoken around the world, we cut ourselves off from full communication with many influential groups in other nations when our foreign service officers and other representatives have to depend on English-speaking foreigners to inform them what is going on and why. Hence, it is a matter for deep concern that only two of sixty staff members in the U.S. embassy in Tehran spoke Farsi and that after the Russians invaded Afghanistan, no one at the U.S. embassy in Kabul could speak Russian and communicate with a Russian soldier who appeared there to defect. It was nearly a week before a Russian-speaking foreign service officer could be flown in from Moscow.

Not only does our nation need well-trained foreign service officers and business representatives, but it also needs citizens who are well-informed about foreign cultures and the history and policies of other nations. The strength and consistency of foreign policy in a democracy depends on the backing of the electorate and not just on the wisdom and experience of its leaders. Our nation's leaders need the understanding and support of citizens who know about the resources, the economic development, the political alignments, and the social aspirations of countries and peoples in the rest of the world.

The responsibility for educating our peoples and their leaders rests, of course, primarily on our schools, colleges and universities. It is unfortunate that they have allowed foreign languages and international studies to be neglected. Yet they are now striving to remedy that situation and in their efforts they have received and continue to need the help of the National Endowment for the Humanities. Through its fellowship and research programs and through its institutional and other grants, the Endowment for the Humanities has promoted the training of teachers and scholars in these areas and has fostered the reform and improvement of courses of study and curricula. Let me cite a few examples.

Last October, the Endowment in concert with the Exxon Educational Foundation funded a National Assembly on Foreign Language and International Studies at the Wingspread Conference Center of the Johnson Foundation in Racine, Wisconsin. At this Assembly, the Association of American Colleges convened prominent educators from all over the country to draw up practical recommendations and guidelines for colleges and universities to follow in dealing with the problems identified by the President's Commission. The report of this Assembly, entitled Toward Education with a Global Perspective, was released in February and distributed to all accredited colleges and universities of the nation. It was first used at a Conference on International Studies held in Baltimore on February 26-28, 1981 and attended by over 200 persons representing 135 institutions of higher education.

To take another case, the University of Maryland, Baltimore County used two Endowment grants to develop a bachelor of arts program that integrates studies in language, literature, and civilization of French, German, and Spanish speaking peoples. The Department of Modern Language and Linguistics has organized this program around a set of core courses that allows students to specialize in one or two languages or a combination of language and literary studies and to gain an understanding of the relationship of language to other cultural phenomena. Reports from that university state:

Faculty have noted that in addition to an increase in the number of language majors over the last three years, there has been a significant increase in enrollment in departmental courses by students from all areas of the university.... Students are enthusiastic about the program.... and have found that the increased understanding of language and communication has helped them in all of their studies at the university.

At Pacific Lutheran University in Tacoma, Washington, a grant from the National Endowment for the Humanities, combined with others, made it possible for a new Foreign Areas Study Program to get started in 1978. The goals of this program were to expand and integrate international studies into a wide range of the university's activities and to establish an undergraduate major in Foreign Area Studies. Although the Program is still under development, already 797 students (30% of all undergraduates at Pacific Lutheran) have enrolled in its courses and 47 have declared minors in Foreign Area Studies. The university has judged it so successful that they are now planning to introduce it into other areas such as the School of Business Administration where it will provide courses in international economics, trade, and business relationships. It also shows promise of supporting the study of non-Western languages such as Chinese and Japanese.

Other examples could be cited at great length but these are enough to show that the National Endowment for the Humanities is serving the nation and its vital interests exceedingly well. It is helping colleges and universities reform and improve studies in foreign languages and international affairs. These examples clearly demonstrate two points.

- First that it is in the national interest to maintain the National Endowment for the Humanities and that there is an important federal role for it to play in helping the nation's colleges and universities educate citizens with proficiency in foreign languages and understanding of international affairs.
- Second that a cut of 50% in a budget calculated in tens of millions rather than billions of dollars is excessive and will impair the ability of the Endowment to serve the nation.

General GAVIN. Thank you, Mr. Chairman.

I am James M. Gavin, soldier retired, former Ambassador to France, and until recently Chairman of the Board of Arthur D. Little, Incorporated. I have been Chairman of the Board for some 20 years.

Perhaps I should add background to why I am here.

I grew up as an orphan in a foster family in Pennsylvania in a small town. My father was a coal miner.

As early as I can remember I worked before school and after school. We had no library in the town. The only way I could get books was to take them out of the bookstore and get them back before they caught me once in a while, which I did.

I read every book I could get my hands on. When I got through the eighth grade, I was put on full-time work, and that was the end of my education.

I decided to leave, and I wanted to get an education. I joined the Army, and there I went to a post where they had a library. I read books continuously. After about six months there, they gave me an opportunity to go to West Point if I could pass the entrance examinations; I passed. I have been reading books and going to libraries ever since and writing books as well.

I owe my being here and my motivation to my own ability to get help from our great society through the library system and the educational institutions.

I am here as a concerned citizen and as a spokesman for an alliance of associations and individuals bound together by the conviction that a democracy such as ours must promote knowledge in the humanities, as well as in the sciences.

My lifetime of public service at home and abroad, in peace and in war, has given me an unusual opportunity to observe and understand what great value learning in the humanities, especially learning in foreign languages and cultures, is to our nation and to the maintenance and defense of its principles and interests.

In 1979, the President's Commission on Foreign Language and International Studies, under the chairmanship of Dr. James Perkins, expressed dismay that so few Americans could communicate in a language other than English and that knowledge of other cultures and understanding of the policies and interests of other nations were seriously deficient.

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Not only the conduct of business but the conduct of diplomacy depends upon effective communication between us and other nations and peoples.

Although English is widely spoken around the world, we cut ourselves off from full communication with many influential groups in other nations when our foreign service officers and other representatives have to depend on English-speaking foreigners to inform them what is going on and why. That has happened.

Hence, it is a matter of deep concern that only two of 60 staff members in the U.S. Embassy in Tehran spoke Farsi and that after the Russians invaded Afghanistan no one in the U.S. Embassy in Kabul could speak Russian and communicate with a Russian soldier who appeared there to defect. It was nearly a week before a Russian-speaking foreign service officer could be flown in from Moscow.

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The strength and consistency of a foreign policy in a democracy depends on the backing and understanding of the electorate and not just on the wisdom and expertise of its leaders.

Our nation's leaders need the understanding and support of its citizens who know about the resources, the economic development, political alignments, and the social aspirations of countries and peoples in the rest of the world.

The responsibility for educating our people and their leaders rests, of course, primarily on our schools, colleges, and universities. I believe it rests on us as well. In any democracy, we have an obligation to that democracy to develop ourselves as individual citizens to the fullest and be contributing members to the working of a democracy. It is not something that we take for granted. We must work at it.

It is unfortunate that the educators have allowed foreign languages and international studies to be neglected. Yet they are now striving to remedy that situation and in their efforts they have received, and continue to need, the help of the National Endowment for the Humanities.

Through its fellowship and research program and through its institutional and other grants, the Endowment for the Humanities has promoted the training of teachers and scholars in all these areas and has fostered the reform and improvement of courses of study and curricula. Let me cite a few examples.

Last October, the Endowment in concert with the Exxon Educational Foundation funded a National Assembly on Foreign Language and International Studies at the Wingspread Conference Center of the Johnson Foundation in Racine, Wisconsin. At this Assembly, the Association of American Colleges convened prominent educators from all over the country to draw up practical recommendations and guidelines for colleges and universities to follow in dealing with the problems identified by the President's Commission.

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partment of Modern Language and Linguistics has organized this program around a set of core courses that allows students to specialize in one or two languages or a combination of language and literary studies and to gain an understanding of the relationship of language to other cultural phenomena.

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Although the program is still under development, already 797 students—30 percent of all undergraduates at Pacific Lutheran—have enrolled in its courses and 47 have declared minors in Foreign Area Studies. The university has judged it so successful that they are now planning to introduce it into other areas, such as the School of Business Administration, where it will provide courses in international economics, trade, and business relationships. It also shows promise of supporting the study of non-Western languages, such as Chinese and Japanese.

Other examples could be cited at great length, but these are enough to show that the National Endowment for the Humanities is serving the nation and its vital interests exceedingly well, in my opinion. It is helping colleges and universities reform and improve studies in foreign languages and international affairs.

I would like to make two points in conclusion. These examples, I believe, amply support these points.

First, it is in the national interest to maintain the National Endowment for the Humanities, and that there is an exceedingly important federal role for it to play in helping the nation's colleges and universities educate citizens with proficiency in foreign languages and understanding of international affairs.

Second, that a cut of 50 percent in the budget calculated in tens of millions rather than billions, as some programs are, is excessive and will grievously impair the ability of the Endowment to serve the nation.

That concludes my statement, Mr. Chairman.

Mr. YATES. Thank you very much, General. Are there questions?

Mr. DICKS. General, you have made a very complete statement. Your perspective as a retired Army general is important to this committee. Your touching upon the deficiencies in foreign languages is particularly important, not only from a military perspective, but also from an intelligence perspective.

This testimony will be helpful in presenting our case to a lot of others in the House and the Senate who are concerned about

defense and intelligence issues, as well as having a concern for the humanities. I want to congratulate you on an excellent statement.

General GAVIN. Thank you.

I would like to mention that I lived in Asia for two years and the Philippine Islands in the thirties. I lived in Europe for ten years. I have had a home and family in Italy, Germany, and France at one time or another.

So I am very sensitive to how we get along with other people, how we learn their languages and how we study them and understand them. It is an amazing phenomenon. No matter what the news is here, take a trip to Europe and read the same headlines and the same discussions on the same problems. They take an entirely different stand on them time and again. It is important we understand each other.

Mr. YATES. I think that is a very important point.

I think the point you are making is that we have to know and understand the cultures of other people, and the humanities have done that in a superlative way.

I have one of their contributions here: The Treasures of Tutankhamen. It says:

This exhibition has been made possible by generous gifts from Exxon and Robert Wood Johnson Charitable Trust and matched by grants of the National Endowment for the Humanities.

So there is a role. There is a partnership role to be played here by business and by the Federal Government. This is not a case of exclusivity. It is a case of cooperation and of working together that I think is exemplified so well by the magnificent exhibition that brought these Egyptian artifacts to this country and gave the opportunity literally to millions and millions of people in various cities in the country to become acquainted with the ancient Egyptian culture.

Mr. DICKS. Do you agree with Mr. Johnson, who I thought also gave a very excellent statement, that if we cut back this program 50 percent as has been suggested by the Administration, the private sector will reduce its activities correspondingly? I believe that the Challenge Grant program is vitally important in getting the private sector involved in contributions for the Humanities. By reducing the NEH this much, are we going to undercut the private side of this program as well? Do you agree with that?

General GAVIN. Yes, I absolutely do. I listened to him say that.

I have sat in many a board room and on many a committee of a board making decisions in matters of this nature. So often, members are trying to find some reason not to make a contribution and are motivated with overdrive to do it. They want to find reasons not to.

I would say they would see this as a lack of interest and lack of support and, therefore, it would translate itself into their own lack of support and time.

Mr. DICKS. Can you also say affirmatively that the Challenge Grant program operates as an incentive to get people in the private sector to do more?

General GAVIN. Yes. I have been on any number of fund-raising committees and am chairman of committees and so on. I am Trust-

ee for the Museum of Fine Arts and that sort of thing. I am aware of these. Oh, yes, by all means.

Mr. AuCOIN. Mr. Chairman, on this point, it would be useful to get on the record what the impact with regard to private contributions would be in the face of severe cuts of this kind for the smaller projects.

I am fairly confident that some of the larger and more well-known institutions could struggle through with deep cuts in these two funds. My real concern is for the smaller, lesser-known institutions which are really struggling and where you find incredible creativity and incredible contributions but need that important assistance at the beginning and for whom recognition by the endowments may be the critical thing. It is a certificate or credential that then gives assurances to the private contributors that this is a worthy endeavor.

I would like to read you two quotes from two institutions in my State in Oregon which fall into this category and see to what extent you might agree with the statements from the director.

I quote Corey Taves, the Assistant Director for the University of Oregon Summer Music Festival, which has received a \$4,500 grant from the National Endowment for the Arts. The Director says:

The grant money we received from NEA certifies to our contributors that we have a worthwhile project. It gives them an added incentive to increase their contributions. It adds quality, visibility, and attracts interest in donors, as well as tourists, to our festival.

There is a very creative theater in the city of Portland, Oregon, which is operating on a \$5,500 grant from the National Endowment for the Arts. It is the Storefront Actors Theater. The director, Carol Ann Ivy, says the following:

NEA funds have allowed us to take giant steps toward self-sufficiency. We recently moved to a new facility downtown. After launching our first fund-raising campaign, we have doubled our seating capacity.

It is one of the most creative theaters in Oregon.

She goes on to say:

We are able to present to the community the credential of recognition by the National Endowment for the Arts which, in turn, helps in our fund raising.

The stories like this are countless. They go beyond Oregon; they are everywhere. They are not just from within the projects that are assisted by the National Endowment for the Arts. It is for the humanities as well.

I take it you would agree with that. I wonder if you might want to make a statement.

General GAVIN. Yes, I would certainly agree with that.

I would be more concerned for the little fellow than for the big in problems of this sort. There are those who are striving and struggling in communities where they are desperately needed.

I mentioned the fact that there was no library in my home town. They have a library now, but it is only paperbacks, only a few hundred volumes. I support it financially, and I am a trustee of it.

That is the only library boys or girls can go to in that community within walking distance; that is ten miles. They walk that far to get a good book.

It is little people like that who are going to be dangerously hurt by this sort of cut.

Mr. AuCoin. Mr. Chairman, I would like to insert that material in the record at this point.

Mr. YATES. Without objection, that may be done. Thank you General Gavin for your testimony.

[The information follows:]

March 24 and 25, 1981

To be inserted for testimony before House Appropriations
 Interior Subcommittee
 Outside witnesses for the National Endowments
 for the Arts and Humanities

Congressman Les AuCoin:

I would like to site several examples of NEH and NEA grants to organizations and individuals in Oregon:

National Endowment for the Humanities

- 1) Portland State University, Humanities Studies Department, \$6,300: The grant pays only for a consultant's fees to help PSU develop a humanities curriculum for adults. Their goal is to provide adults with a series of courses which are not job-oriented, but aimed at serving the cultural curiosities and needs of adults in a large city.

Project director, Judah Bierman: "We are able to move forward only as a result of this small grant from the NEH. This seed planted by the NEH has made it possible to serve more closely the needs of people in Portland. We cannot consider projects of this nature without some form of viable recognition or support. The NEH grant is recognition of an endeavor worth supporting."

- 2) PSU History Department, \$250,000.: This is a 3-year development grant to develop a graduate-level public history program. Their objective is to provide training and opportunities for students to become historians outside the traditional academic confines. Courses in this outreach-type program, which will benefit graduate students and citizens in the community, will be offered by both PSU and the Oregon Historical Society in history, archeology, preservation and cultural resource management.

Leslie Wildesen, project director: "This program would not have existed without the NEH grant. The development grant ends in June, and we now have attracted the interest of the university and faculty to a sufficient degree to continue the program. The grant enabled us to pick up the needed "adjunct faculty" made up of practitioners rather than academicians -- preservationists, architects, archeologists, Oregon Historical Society staff members."

- 3) Laura Paglin, Portland high school senior, \$1,000: This grant provides complete support for the production of a clay animated film on the contribution of a black inventor to the everyday functioning of American society. Ms. Paglin is exploring the life of this inventor, who, at the turn of the century, developed a revolutionary shoemaking device. She will combine the "clay-mation" with live action and a brief history of black inventors.

Ms. Paglin: "This is a wonderful example of how a small amount of money can be stretched to fund a project like mine. Because of the NEH grant, I will be able to make a film of professional quality and distribute it to public school districts and Black Studies department in colleges, which have expressed interest in my film."

- 4) Bennett M. Voyles, Lincoln City, \$938: This grant will explore pioneer newspaper publishers of the Oregon Coast. He is studying the foundations of early Oregon coastal newspapers and the lives of those who first came there to report and publish.

National Endowment for the Arts

- 1) University of Oregon Summer Music Festival, \$4,500. This grant contributes to the Festival's total operating budget of \$110,000. This small music festival, which has attracted national reviews, is in their 12th year and continuing to expand.

Cory Toevs, assistant director: "The grant money we receive from NEA certifies to our contributors that we have a worthwhile project; it gives them an added incentive to increase their contributions. It adds quality, visibility and attracts tourists to our Festival, and tourism is Oregon's 3rd largest industry. With the proposed cuts, we would not be able to attract the large audiences we need to move our performances to the new Eugene Civic Arts Center.

The most valuable part of any NEA grant is that it serves as a stimulus, rather than a deterrent, to private support for arts programs. In addition to serving as a stimulus for private support NEA grants serve another extremely important function. I believe that the U.S. government has a responsibility for maintaining the cultural heritage of this country and if it withdraws support for artists and arts organizations, it is ignoring this responsibility completely."

- 2) Oregon Mime Theatre, Dance Touring Program grant: Money from this program grant picks up 30% of the fee charged by the Theatre to travel around the state. This enables the 3-person Theatre to offer their services at a reduced rate to sponsors, while still meeting their budget. The Oregon Mime Theatre is the only performing arts group in the state to be included in this program.

Evy Warshawski, Manager: "We survive by the 12 weeks of subsidy for our touring program provided by the NEA. Our sponsors take advantage of the incentive of a reduced fee and we are then able to travel to areas which lack any type of theatre. For example, we charge \$2,730 for a 2 1/2 day program, but, with the NEA subsidy, a sponsor pays \$1,900. This program allows us to become a part of the community for a short period of time, around the state, as well as around the country."

- 3) Storefront Actors Theatre, \$5,500: The grant to this small professional theatre in Portland provided about 12% of their total budget. They are one of the most successful, original theatres in the state. The Theatre performs original theatre, created and produced by actors from their company.

Carol Ann Ivey, director: "NEA funds have allowed us to take giant steps toward self-sufficiency. We recently moved to a new facility downtown and, after launching our first fundraising campaign, we have doubled our seating capacity. We are able to present to the community the credential of recognition by the NEA, which helps in turn with our fundraising. The Oregon Arts Commission has said our theatre is one of their success stories."

OREGON COMMITTEE FOR THE HUMANITIES

March 10, 1981

The Honorable Les AuCoin
House of Representatives
Room 231
Cannon House Office Building
Washington, D. C. 20515

Dear Mr. AuCoin:

Thank you for your recent letter expressing concern for continued federal support of the arts and humanities. Such concern in Congress is vital if we are to sustain the great progress that has been made in the past decade in broadening community experience of these areas of learning and creativity.

In Oregon the local consequences of the proposed reductions are clear: a significant decline in programs of libraries, museums, community colleges, four-year institutions, elementary and secondary schools, community arts agencies and many other organizations. This will be true throughout the state and will be especially severe if the state humanities committees are significantly cut back.

Moreover, the scale of the proposed cuts strikes at the potential for increased private support in these areas as well. In recent years, the Oregon Committee for the Humanities has used NEH Gifts and Matching Authorization to encourage an increasing number of corporate foundations and philanthropic organizations to share in the funding of community humanities programs. Sixty such foundations and organizations have made gifts to our grantees in the past three years. Recognizing that some reduction in federal support is inevitable, the Committee is now undertaking an effort to encourage even greater private support.

Our ability to maintain the statewide, local character of this program and to continue to shift toward greater, on-going private support is seriously threatened by the prospect of such a large reduction in 1982. When legislation containing the proposed cuts comes before the Interior Subcommittee of the Appropriations Committee, we urge you to consider three things:

1. The extent of the cuts undermines the ability of the state committees to raise funds within their state partly because it raises a doubt in the minds of potential donors that these NEH programs--indeed, that the NEH itself--will continue to exist for long. We believe that the law should contain language reaffirming bipartisan Congressional support for the National Endowment for the Humanities

Room 410
418 SW Washington
Portland, OR 97204

503/241-0543

The Honorable Les AuCoin
March 10, 1981 - page 2

and for continued NEH funding of the state humanities committees. The law should make clear that Congress regards the Endowment and state committees as proper and valuable, federally supported agents of cultural enrichment for the nation as a whole.

2. In Oregon we have been highly successful in fostering statewide use of these funds. In 1978-80 sixty Oregon communities carried out programs funded by OCH. (A list of these communities is attached.) More than a hundred and twenty humanities teachers from twenty colleges participated in more than three hundred project activities sponsored by one hundred and eighteen nonprofit organizations. Twenty-five colleges and universities have identified an OCH faculty liaison representative to help local residents develop programs.

If state and local decision-making and benefit in the use of federal funds are a prime concern, the state humanities committees should have some protection in the legislation. We believe the law should contain language that requires continued funding of the state committees as close to the 1981 level as possible and that in no event should the allocation to any state be reduced by a percentage greater than 20%.

3. One thing that has not been sufficiently appreciated is the amount of private support for the humanities that has been generated by the National Endowment, support that would not exist without NEH challenge grants and gifts and matching authority. In Oregon, a state with few large philanthropic institutions, we have encouraged much private support, making it possible to stretch limited funds farther than we could without it. We believe the law should contain language protecting the Endowment's gifts and matching authority and requiring the continuation of at least the level of G & M authorization currently extended to each state committee.

Each state committee is a board of citizen volunteers: community residents, state and local officials, professional persons, businessmen, and university teachers and administrators, representing diverse areas of the state and a variety of ethnic constituencies. The nomination process for membership on the committee is open and membership rotates regularly. Each committee is an excellent model for the state-based decision making so strongly emphasized by the new administration.

We hope you will give these programs your support when funding for the Endowment comes before you.

Sincerely,

John E. Brown
John E. Brown
Chairman

Mary T. Winch
Mary T. Winch
Past Chairman

*Thank you for your strong effort.
- a heart warmer*



Oregon Shakespearean Festival Association

March 17, 1981

Ashland, Oregon 97520

The Honorable Les AuCoin
Room 231 Cannon House Office Building
Washington, D.C. 20515

Dear Congressman AuCoin:

This is written in response to the Reagan administration's announced intention to reduce the budgets of the National Endowment for the Arts and the National Endowment for the Humanities by 50% for Fiscal Year 1982. The President himself, in announcing such a proposal, declared that this particular pull-back by the Federal Government would be more than offset by increased private sector, especially corporate, contributions.

We believe that most Americans identify sympathetically with the goal of getting this nation's economy back on the right track. Most would even support, apparently, across-the-board expenditure reductions that are mindful, equitable and not unduly burdensome on any one or few constituencies. We submit that this particular proposed reduction is neither mindful nor equitable, nor is it in tune with known facts about the present capacities of the private/corporate sector. One is tempted to say that it even verges on someone's notion of the punitive.

As countless articles and news media reports have shown, the downturn of the economy together with incredible inflation are putting the brakes on the recent increases in private/corporate largesse. Except mainly for large oil companies, the story from all sectors of the country is the same: Depressed retail sales, too high interest rates, company lay-offs and cutbacks are all conjoining to cause a pull-back in corporate and foundation gift planning. In short, the President's assumption may be correct for the long-haul, but it could be disastrous for the near-term haul. Many arts organizations simply cannot survive those near-term years on the expectation of extensive increased private/corporate support.

The Oregon Shakespearean Festival Association completed its 46th season in 1980, and is one of the oldest and largest not-for-profit repertory theatres in North America. In 1980, we attracted 265,000 persons to 579 performances of 12 plays in our three theatres. When one considers that only 9% of these patrons live within 150 miles of Ashland, and that only 40% of all of our patrons come from within Oregon, one can begin to see that, along with Crater Lake, the Festival is one of the largest generators

The Honorable Les AuCoin
 March 17, 1981
 Page 2

of tourism in Oregon. And tourism is Oregon's third largest industry after timber and agriculture, both of which are having problems. Using the State of Oregon's own conservative multiplier, the Festival had a 1980 economic impact of over \$41 million.

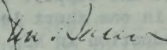
Yet we are scrambling to stay alive! Our annual earnings gap has now reached \$700,000, or 23% of our \$3 million 1981 budget, and it is growing. Our "gap" is small compared to the 40%-70% plus gaps of other major arts groups. But because of the dispersed character of our audience and our geographic remoteness from major urban centers, we face relatively greater difficulty in meeting this annual need. We have priced our tickets over the years to recognize the travel costs our patrons must bear to see our plays. We have been consciously aware of the needs of senior citizens on small fixed incomes, and of more than 70,000 school students whose contacts with the Festival in 1980 were heavily subsidized by us. Even so, you will note from the enclosed chart that our top ticket prices have increased 50% in the last five years. Further increases, together with inflated costs of travel, could make serious inroads on our future sustenance.

In a day when the Federal Government is spending \$52 million on military bands, but only \$13.5 million on the arts and humanities, such a cutback as that proposed by Reagan, Stockman and company is, to us, unthinkable.

We hope to receive a reaction from you at your earliest convenience.

Most cordially,

OREGON SHAKESPEAREAN FESTIVAL ASSOCIATION


 James K. Sours, Ph.D.
 Director, Resource Development

JKS:pp-1

Enclosure

cc: Bill Patton
 Peter deC. Hero
 Richard Lewis

2221 NE 53rd St.
Portland, OR 97213

March 20, 1981

The Honorable Les AuCoin
Congress of the United States
House of Representatives
Washington, D.C. 20515

Dear Congressman AuCoin:

We just want to send a brief follow-up to our recent notes applauding you on your support of the arts nationally and in Oregon. We urge you to continue the important fight ahead against the drastic and unwarranted 50% reduction in National Endowment for the Arts' funds.

The impact of this reduction would be devastating to the activities of both of our arts organizations. As the only performing arts group in the State to be on the National Endowment for the Arts' Dance Touring Program, the Oregon Mime Theatre is directly affected by such cuts. The DTP program has enabled us to offer sponsors in smaller communities throughout Oregon and the United States, a reduction in our touring fees, ensuring us the opportunity to perform in communities otherwise left out of this cultural experience. These subsidies have allowed the Company to perform for many more thousands of children and adults than otherwise would have been possible. We feel that we have helped enrich the lives of these people through this experience.

The Northwest Media Project is the only organization devoted solely to aiding independent filmmakers and video artists in the region and to educating the broad public about their work. Our services help keep alive important films about life in the Northwest that cannot find outlets in the commercial media. The National Endowment for the Arts has staunchly and steadily nurtured our activities over the years.

Our organizations are only the very tip of the iceberg defining arts activity in the State of Oregon. The scope of the wealth of work being done here with encouragement and support from the National Endowment for the Arts cannot be covered in one short letter. But what we can say with certainty is that a reduction in NEA support will deal a direct and heavy blow to us all.

Very sincerely yours,

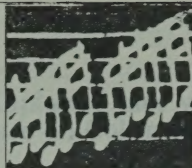
Evy Warshawski
Evy Warshawski, Manager
Oregon Mime Theatre

M
Morrie Warshawski, Director
Northwest Media Project

cc: Sidney R. Yates, Chairman
Interior Appropriations Subcommittee
House of Representatives

James A. McClure, Chairman
Interior Appropriations Subcommittee
Senate

ret. to SC



The University of Oregon
Summer Festival of Music
Eugene, Oregon 97403
Telephone: 503/686-3761

7043

March 9, 1981

The Honorable Les AuCoin
U.S. House of Representatives
Washington, D.C. 20515

SC *good letter!*

Dear Representative AuCoin,

Thank you for your recent letter regarding the state of the National Endowments for the Arts and Humanities. I am delighted that you and Senator Hatfield are joining the Congressional Arts Caucus and I hope you can save the NEA and NEH budgets.

I read a very distressing comment from one of President Reagan's aides in the Wall Street Journal several weeks ago explaining that the current administration was cutting the arts and humanities budgets because it did not want arts organizations to view the federal government as a funding source "of first resort." Unless that aide and I are using a different dictionary to define "of first resort," the administration is woefully misinformed about the percentage of federal support present in any organization's budget. For example, the UO Summer Festival of Music received a \$4,500 grant from the NEA last year. Our total budget for that period was \$110,000. There is not a single arts organization in the state of Oregon that gets more than about 5% of its budget from federal sources.

The most valuable part of any NEA grant is that it serves as a stimulus, rather than a deterrent, to private support for arts programs. All NEA grants require that at least twice as much money is raised for any given project, and in the case of Challenge Grants, three times more money, from new sources, must be found before any federal support is granted.

In addition to serving as a stimulus for private support, NEA grants serve another extremely important function. I believe that the U.S. government has a responsibility for maintaining the cultural heritage of this country and if it withdraws support for artists and arts organizations, it is ignoring this responsibility completely.

Thank you very much for supporting the arts and if you need anything from us, please let me know.

Sincerely,

Cory Toevs
Assistant Director

Dr. Dalton
Assoc. Dir.

UMPQUA VALLEY ARTS

1624 W. Harvard
Roseburg, OR. 97470

March 16, 1981

Les AuCoin
Congress of The United States
House of Representatives
Washington, D.C. 20515

Dear Mr. AuCoin:

On behalf of the Board of Directors of The Umpqua Valley Arts Association, I would like to express our concern for the future of National Endowment funding for the Arts and Humanities.

As a community arts group serving a predominately rural area of Douglas County, we are very supportive of continued and increased federal funding for the arts.

Our organization provides our community with a centrally located arts facility with rotating gallery exhibitions which are free to the public and many other cultural programs. Our city of Roseburg supports this endeavor by providing us with our facility.

We have relied upon Oregon Arts and Humanities Commission funds for special workshops and touring performing events. These programs have reached hundreds of people in our community, and would otherwise be impossible without such support.

Our community is small; the majority of our population has little or no access to cultural activity other than on the local level. Continued funding of sources that do trickle down to communities like Roseburg can make a real difference in the quality of life for our community members. This funding stimulates interest - and future support for the arts.

Please urge your subcommittee to back the arts for the sake of the "little guys" like Umpqua Valley Arts Association.

Best regards,

Irene Zenev

Irene Zenev
Executive Director
UMPQUA VALLEY ARTS ASSOCIATION

IZ:mmc

WITNESS

JUSTIN KAPLAN, AUTHOR

Mr. YATES. Our next witness is Mr. Kaplan. I met you and your wife last Sunday morning or a week before on Columbia Broadcasting System.

We are delighted to have you. We congratulate you upon your achievements in the literary field. Your latest book is "Walt Whitman, A Life". It was just published.

I was reading a speech of John Kennedy. In the course of discussing the arts, he said: "I hear America singing, said Walt Whitman. He would certainly hear it singing with many voices if he were alive today."

That was 1962. There are many more voices singing now.

We are delighted to hear from you.

Mr. KAPLAN. By profession, I am a writer, a biographer and critic. My work deals with American history and literature, two of the major concerns of the National Endowment for the Humanities. A book of mine published last fall, the Biography of Walt Whitman, which you mentioned, drew upon endowment-sponsored scholarship done by others, specifically additions of this great poet's previously unpublished letters, notebooks, and the like.

As the author of the Biography of Mark Twain, published in 1966, the year after the endowment was published, I have studied with retroactive gratitude the flow of similarly sponsored additions to the writings of our preeminent humorist and storyteller.

I mention this to suggest that we all build on the work of others.

I have not requested or received support for my own work from the endowment. But in an editorial or consultative capacity, I have been involved in endowment projects, two of which I would like to describe very briefly.

The first is a series of continuing public television dramatizations of Mark Twain's books. This is a quote from the Washington Star on the subject of life on the Mississippi when life on the Mississippi was shown last November. This shining production is distinctively America. What we have at last is Americans beating the British at their own game. I should add that this game is memorable and significant recreations of the past.

Mark Twain's version of the Civil War will be visible on public television in April.

The second project, the fruits of which will be visible early in 1982, is a series of durable, convenient, and reasonably priced editions designed for the general reader of some of our classic America authors for example, Hawthorne, Melville, Stowe, Jefferson, and Poe. This series is called The American Library.

Underlying and urgently justifying this project is a shocking circumstance. The publishing marketplace is a notoriously fickle arena for free enterprise.

As a result of the exigencies of book publishing today, a substantial part of our basic literary and historical heritage is becoming inaccessible. Except in the rare book market, many classic books

are unavailable, either in hardbound or paperback editions, reliable or unreliable texts.

This is a crippling problem for public and institutional libraries which are already curtailed in their budgets. They can find only prohibitively expensive replacements for their copies of classic books that have been lost, stolen, or mutilated or have simply fallen apart with age and use. Here, illustratively is where government enterprise must intervene for the common good; private enterprise surely will not.

Our libraries, and their melancholy inventories of lost, stolen, mutilated and worn-out books, symbolize the general situation of the humanities in a time of rising costs and shrinking budgets. We are in danger of losing touch with our collective memory, experience, and vision that pluralistic, democratically representative aggregate that we think of as American culture.

On its way to becoming a superpower, this young nation, regarded at first by much of the world with derision and skepticism as a dubious political and social experiment, developed an invigorating awareness of itself through history, literature, art, music, and language.

One extraordinary five-year period between 1850 and 1855 saw the publication of Hawthorne's *Scarlett Letter* and the *House of the Seven Gables*, Melville's *Moby Dick*, Mrs. Stowe's *Uncle Tom's Cabin*, Thoreau's *Walden*, and Whitman's *Leaves of Grass*.

It was impossible to be skeptical about democratic culture then. There have been American renaissances since, and we depend on others.

Self-awareness, one of the springs of national vitality, manifests itself not only in literary and formal ways but in folklore, the oral tradition, popular culture and tall stories, local, regional and ethnic culture, and contributions to anonymous history. All of this is within the purview and charge of the National Endowment.

What we are dealing with is not projects of a brick and mortar sort nor of fiscal 1982 alone but something long term and basically agricultural in its nature, the replenishment of the topsoil and subsoil which nourish collective purpose.

Without self-awareness and replenishment, we become as a nation like someone who has suffered a terrible shock an amnesiac, for example, or a victim of hallucinations or violent crime. Such victims do not know who they are or where they came from. Consequently, they have no idea where they are going.

Without knowledge of themselves and the past, they can hardly be responsible shapers of the future. Where there is no vision, the people perish, the Bible says. In the idiom of the present, who then will be the truly needy.

Thank you.

Mr. YATES. Thank you very much.

Whose biography are you working on now?

Mr. KAPLAN. Quite honestly, I am between things. I am trying to make up my mind. I would gratefully solicit your suggestions.

Mr. YATES. As you were testifying, I was thinking of your first book about Mark Twain. I didn't want to call your attention to his impression of a Member of Congress. Of course you remember that.

Mr. KAPLAN. I deliberately suppressed my memory of all that, yes.

Mr. YATES. I really have no suggestion, but maybe we will have. The hearings of the Humanities will take place in a couple of weeks, and maybe that will spark some suggestions.

At any rate, we thank you very much for coming to us today. Good luck in your next suggestion.

Mr. KAPLAN. Thank you.

WITNESSES

BETSY MCCREIGHT, CHAIRMAN, FEDERATION OF PUBLIC PROGRAMS
IN HUMANITIES

SONDRA MYERS, TRUSTEE, UNIVERSITY OF SCRANTON

BERTRAM GREEN, PROFESSOR OF BLACK STUDIES, LEHMAN COLLEGE

Mr. YATES. We now have a panel, consisting of Betsy McCreight, who is Chairman of the Federation of Public Programs in Humanities; Sondra Myers, who is a Trustee of the University of Scranton; and Bertram Green, who is a Professor of Black Studies at Lehman College.

Your statements will all be included in the record.

[The statements follow:]

TESTIMONY TO THE
 SUBCOMMITTEE ON INTERIOR AND RELATED AGENCIES
 OF THE COMMITTEE ON APPROPRIATIONS
 UNITED STATES HOUSE OF REPRESENTATIVES

March 24, 1981

BETSY K. MCCREIGHT

PRESIDENT, FEDERATION OF PUBLIC PROGRAMS IN THE HUMANITIES
 PAST CHAIRMAN, HUMANITIES FOUNDATION OF WEST VIRGINIA

I appreciate being given the opportunity to testify on the FY82 budget request of the National Endowment for the Humanities. I speak from a base of eight years' work with state humanities councils as a board member and past Chairman of the Humanities Foundation of West Virginia, and as current President of the Federation of Public Programs in the Humanities, and from life-long experience with the non-profit sector.

It is my understanding that the administration makes five points in its proposal to cut the budget of the National Endowment for the Humanities 50% below the original proposed for FY82:

- that the national economic situation requires belt-tightening in all federal spending with a view to halting its run-away growth;
- that the historic support for cultural and artistic endeavors came from private philanthropy and state and local governments and it is proposed to restore the "historic reliance" on those sources of funding;
- that federal policies for humanities and arts support must be redirected away from spreading "federal financing to an ever-wider range of artistic and literary endeavor;"
- that federal grants have become "patron of first resort" for the humanities and the arts and should not be so;

Thank you.

Mr. YATES. Thank you very much.

Whose biography are you working on now?

Mr. KARAN. Quite honestly, I am between things. I am trying to make up my mind. I would gratefully solicit your suggestions.

Mr. YATES. As you were testifying, I was thinking of your first book about Mark Twain. I didn't want to call your attention to his impression of a Member of Congress. Of course you remember that.

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- that support of the humanities and the arts by the federal government is of "low priority" compared with other matters.

I should like to comment on each of these points.

NEED TO DECREASE FEDERAL SPENDING

There are few who do not agree on the need to control the growth of government spending in this country, and certainly we who speak for the National Endowment for the Humanities do not think that the Endowment should be exempt from the concern to keep federal spending within limits which do not contribute to climbing inflationary pressures. When one looks at the record of appropriations for the NEH over the past four years (see Appendix) the record shows a total increase of less than the rate of inflation over that period, which means that the NEH has actually been appropriated decreasing amounts over those years. This is hardly the "run-away growth" to which the administration refers. However, if the Congress concludes that decreased federal spending is indeed needed to control inflation, the constituency of the NEH will certainly agree to appropriate participation by the Endowment in the decrease, but we protest that the Endowment should not be made the recipient of disproportionate decreases, as is proposed in the administration budget.

We further protest that a cut in any budget of the proportion proposed for FY82 is more than a cut. It is intended to cause a drastic change in the functions and purposes of the agency. Congress has just completed exhaustive study of the Endowment, leading to its reauthorization for five years. No testimony was received which indicated need for any such drastic change in the purposes of the Endowment, but rather a strong reaffirmation of the directions which the Endowment has taken.

NEED TO RETURN TO "HISTORIC" SUPPORT

There is no doubt that major support for the humanities has come from the private sector and from state and local governments, which have supplied and continue to supply the majority of funds for the educational systems and institutions of this nation wherein the majority of humanities scholarship, teaching and research exist. No one has proposed that this major support diminish in either extent or significance.

It should be pointed out, however, that the Congress found in 1965 that there are significant reasons for the federal government to support the humanities as well, and it has renewed its commitment to those findings periodically up to and including 1980. The federal purposes to be served by support for particular activities in the humanities are spelled out in the legislation, among them the impetus to world leadership in the realm of ideas. Thoughtful observers agree that the world is no longer a place where a leading nation can exert influence on behalf of its values and ideals solely by force of arms, if it were ever so. Through history it has been demonstrated time and again that the strength of an idea is far greater than the strongest army. If the United States of America is to be a leader in the remainder of the 20th century and in the world we hope to leave for our children and grandchildren, it will be through the strength of our ideals and the soundness of our ideas -- which will not be arrived at by short-range thinking and bottom-line focus.

NEED TO CEASE EXPANSION OF HUMANITIES SUPPORT

Over the years there has been a continuing debate over whether federal support can best be given the humanities only through a few superior institutions and individuals or whether it also should be used to build excellence in humanities scholarship and programs throughout this nation. The Congress has repeatedly stated its conviction that all the people of this nation should be served with the best possible scholarship, institutions and programs in the humanities, and that institutions and programs in every state and territory should be strengthened and encouraged to build the humanities as a significant part of their purposes. It does not seem possible that the Congress would be willing to have the progress of these past fifteen years in bringing strengthened humanities institutions and programs to people across this land wiped out by a single fiscal act. One thing which people of this country have come to expect from all government, and especially from the federal government, is equal access to the benefits of government. I cannot believe that the Congress will retreat in the case of the NEH to a policy of support for the few strongest institutions and programs, as will inevitably be the case if the administration budget is adopted. No longer will the Endow-

Page 4

ment be able to seek out scholars and programs and institutions of promise and help nurture them to strength and service in areas, like my state, which have historically lacked strong scholarly institutions. No longer will they be able to initiate programs like the state humanities councils which, with Congressional encouragement, have done extraordinary work in bringing humanities scholarship and methods of thought to people who are not scholars, but who are the backbone of this nation and the electorate on whom we all depend for wise decisions. Let me quote from a letter from Marc Harshman of Moundsville, W. Va. (population 12,405):

...Such a program [of readings by professional writers, which draw from 35 to 50 people to each of five events] would...have been impossible without the [\$330] financial assistance given by the Humanities Foundation [a state program of NEH]... The influence of the arts and humanities represents a contribution to the community more important than even food or employment. I realize this may seem...preposterous...but I hope that you will recall as I do past concerts or lectures or readings,... those special moments when the right words or the quiet ring of a fading banjo not only inspired you but...offered you for your next day something which I can only describe as sustenance. ...We are indeed to face some lean times in the coming years; and we can and must all do with less, but to do without the ideas and inspiration of our artists and scholars is to risk breaking not the body of the people but their very spirit.

NEED TO ALTER FEDERAL POSITION OF SUPPORT

The administration budget asserts that federal funds through the NEH have become the "patron of first resort" for the humanities community. This hardly holds up under the most casual scrutiny when one takes into account the vastly greater sums which go to support educational institutions, publishing, scholarship, research and the rest from state and local governments, from personal, corporate and foundation philanthropy, and in some cases from the profit-making sector. The fact is that federal financial support of the humanities is relatively minute, and the proper requirements of accountability make it relatively difficult to secure, so that, far from being the patron of the first resort, it is more likely the last resort where other funds are available, but in some cases it is the only resort for particular kinds of scholarship, for new and needed programs, and certainly for state humanities councils.

Beyond that, federal funding in the humanities provides a particularly important service for other funding sources, both public and private. That service is the establishment of a generally approved method of determining the quality and abilities of proposers and proposals which the personal, corporate and foundation donor is usually unable to provide or to secure elsewhere. Particularly, many corporations which are just entering the field of humanities philanthropy are anxious to know that the funds they give will be well used and find themselves unable to make the many sorts of determinations needed to assure that. Other funding sources are increasingly looking to the NEH and to state humanities councils to do the difficult work of helping people to put together and write proposals for humanities endeavors which have strength and quality, and to certify through the proposal process that the best of the group are selected for funding. Once these processes, which require time and thought from experts in many fields, are completed, the non-federal funds are much more likely to be available to the proposed program. This may not have been the outcome which the Congress had in mind when it established the Endowment, but it is certainly the fact of today.

We in the Humanities Foundation of West Virginia recently became another sort of case where the private funding source is clearly depending on federal support. The Humanities Foundation of West Virginia has a proposal pending with a private regional foundation of some size for the establishment of an expanded program center for the Humanities Foundation, to be financed over a three-year period by the private foundation. It was received with interest and enthusiasm by the foundation's staff until the week after President Reagan's budget message to the Congress, when they called to say that the proposal would not be submitted to the foundation board for a vote "because of the uncertainty of federal funding." It is abundantly clear that they are willing to finance additional activities by our state humanities council, but only as long as the federal support for the basic operation can be depended upon.

I would like to take this opportunity to report on the work of the state humanities councils in response to the strong urging of the Congress in past years to increase the extent of non-federal support of our program.

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As I said last year, we are seeing evidence of a widespread and growing commitment to public humanities programs by individuals and corporations and other non-federal sources of financing. That commitment continues to grow. Gifts secured by state humanities councils and submitted to the NEH for match with Treasury funds amounted to \$1,425,680 in FY78. At the present rate of submission, they should amount to \$2,566,384 in FY81 -- an increase which beats inflation. With the continued strength of the councils' basic operation, this ability to secure non-federal funds should grow at an increasing rate.

I must hasten to say that it will certainly not row if the basic operation of state humanities councils is undercut as the present budget proposes to do. We are finding that a certain basic support structure is required to develop, operate, evaluate and administer a state humanities program. The structure is not large, and includes a staff of 4 to 6 persons in most cases, but it costs between \$125,000 and \$175,000 per year. This basic support structure is about the same whether the grants program is \$200,000 or \$800,000 (as can be seen on the table included in my testimony before the House Postsecondary Education Subcommittee, which is attached). It enables the state council of 20 or so volunteer citizens to carry out the certification process to which I referred earlier and it also enables them to build an effective fund-raising system to secure additional support for a multitude of small programs across an entire state (in West Virginia's case, 257 projects during the first six years of operation which reached 3.1 million people in all 55 counties of our state).

NEED TO CUT LOW PRIORITY PROGRAMS

It can be argued soundly that federal support for the humanities is already a lower priority than it should be, since the amount of definite funds recommended in the administration budget is just about equal to that it recommends be spend for the support of military bands for the same period. The administration priority for support of the humanities can be clearly seen when one compares the recommended \$1.034 BILLION budget for the National Science Foundation, which is a 6% cut for that

agency, as contrasted with \$74 million recommended for the NEH. It can further be pointed out that the \$82 million cut from the original NSF request is less dollars than the \$85 million cut from the geometrically smaller request of the NEH, and will specifically cut support for the social sciences, which will throw some anthropological and other projects on the already-devastated resources of the NEH.

The establishment of the National Endowment for the Humanities showed that the Congress recognized a federal responsibility in the life of the humanities in this country. The purposes state in the legislation (support of progress and scholarship; assistance of state, local and private agencies and organizations; creating a climate to encourage freedom of thought and inquiry; building worldwide respect for this nation's qualities as a leader in the realm of ideas; fostering wisdom and vision in the citizens) clearly show the significance of the priority of the work of the humanities to the future of this nation. Even were one to discount the language considerably, it must be admitted that the federal government has the major responsibility for preserving our democratic government, which can only be done through insuring "wisdom and vision in its citizens." Norman Cousins pointed out some years ago

...that the debates that went into the making of this American democracy were concerned not just with its institutions and governing principles, but also with the capacity of human beings to sustain those institutions and principles. [It is crucial that] the people of a democracy themselves...understand what it means to hold the ultimate power of society and that they have enough of a sense of history and destiny to know where they have been and where they ought to be going. Thomas Jefferson...knew that the developed mind is the best assurance that this political system can be made to work -- a system based on the informed consent of the governed. If this idea fails, then all the saved tax dollars in the world will not be enough to prevent this nation from turning on itself.

STATE HUMANITIES COUNCILS

I would like to call particular attention to the chart of state humanities council information appended to this statement. It shows the variety of situations across the nation, variety in date of establishment of state humanities councils, variety in total amount of NEH grant and

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and in percapita amount of grant, and variety in the amounts of non-federal gifts submitted for match to the NEH. (I should emphasize the footnoted point that states do not necessarily submit all non-federal funds for match and/or may hold them for submission in a subsequent year, so this chart does not necessarily list all funds raised by a council.) You can also see by comparing the right-hand column with the 1980 grant column the situation the councils will be in if the administration budget proposal is approved. The fact is that no council will be able to maintain the support system it needs for a sound grants program, and few will have enough funds for grants to do more than provide pre-packaged programs for circulation to the most-populous areas. It is certain that their ability to attract non-federal funding will be severely damaged: by the lack of staff time to provide needed support for volunteer fund raising work; by the lack of creative grant projects which attract non-federal funding; by the lack of even the modest grant-making by which projects can be "certified" to private donors. In the larger states the program possibilities under this sort of reduced funding may be so limited as not to be worth attempting at all. As you can see from the chart 17 states already operate on grants of less than 10cents percapita and 6 of them are at 5 cents or less.

State humanities councils are doing an important work across this nation, making what other people have been and are and have hoped to be a part of the thoughts and lives of many Americans who are not enrolled in school any longer. We believe that it is a work worth our volunteer time (which includes more than one thousand board members each year giving several hundred hours each) and we believe that the Congress thought it was important to be done or we would not have been asked to undertake it. We do not ask that you pay us for our efforts -- we are glad to give our time and skills -- but we do ask that you not pull the basic support out from under us at a time when state humanities councils are becoming known and valued parts of the non-profit sector of every state, and of Puerto Rico and the District of Columbia. We are beginning to raise a significant part of our own support and that part will grow, but we need your continued backing to be able to make that growth.

APPROPRIATIONS

NATIONAL ENDOWMENT FOR THE HUMANITIES

Fiscal year	Definite funds (thousands)	Percent increase	Total Appropriation (thousands)	Percent increase
1966	\$ 2,500		\$ 2,500	
1967	2,000	(20.0)	5,000	100.0
1968	3,500	75.0	4,000	(20.0)
1969	3,700	57.1	5,700	42.5
1970	6,050	63.5	8,050	41.2
1971	11,060	82.8	13,560	68.4
1972	24,500	121.5	28,000	106.5
1973	34,500	40.8	38,000	35.7
1974	44,500	29.0	51,000	34.2
1975	67,250	51.1	73,750	44.6
1976(1)	92,750(1)	37.9	100,750(1)	36.6
1977	77,500	(16.4)	84,500	(16.1)
1978	87,800	13.3	95,500	13.0
1979	98,300	12.0	134,800	41.2
1980	100,300	2.0	138,706	2.9
1981	106,522	6.2	140,022	0.9
1982 request	59,000	(44.6)	74,000	(47.2)

(1) Includes extra transitional quarter

TESTIMONY TO THE SUBCOMMITTEE ON POSTSECONDARY EDUCATION
OF THE COMMITTEE ON EDUCATION AND LABOR

U.S. HOUSE OF REPRESENTATIVES

February 25, 1981

BETSY K. MCCREIGHT

I am here because of my connections with state humanities councils as Chairman of the Humanities Foundation of West Virginia and President of the Federation of Public Programs in the Humanities (the national association of state humanities councils). Perhaps I should begin by acquainting those who do not know us well with the history and work of state humanities councils.

State humanities councils were established beginning in 1970 at the strong urging of the Congress. Until that time no one in the country had undertaken to entice those no longer in school back into the life of the mind. I suspect that the traumas and divisions of the 1960s were important in helping the Congress and the National Endowment for the Humanities to see the need for the ordinary citizen of this country to become more aware of the values and aspirations of our past, and of opportunities and hopes for the future. Somewhere along the way we Americans have put aside our concern for the world which we will leave to our children and grandchildren in our haste to enjoy the bounty of the world which our parents and grandparents worked to leave us.

State humanities councils are about just that sort of thing--helping ordinary citizens and un-ordinary ones as well to see the part they have to play in the life of this democracy, and the part others play as well. One of the lessons which we are beginning to learn is that diversity is enormously enriching, but divisiveness can also come from it and destroy the consensus upon which democracy must rest. We believe that human beings must make decisions which affect their lives and those of others; that the human past has much to tell us about the present and the future; that thought process is vital to the achievement of purpose; and that free society is absolutely dependent on a functioning citizenry.

Ours has not been a job which was easily or quickly done. The humanities as a concept is more difficult to grasp than its components--history, philosophy, comparative religion, literature, and the rest--and it was a knotty problem to invent a system by which people could be interested in taking time for activity which was educational more than entertaining, and which might just stir them to change their minds about a thing or two. Nevertheless, the fifty-two humanities councils which were set up in the states, Puerto Rico, and the District of Columbia set about the task with vigor and enthusiasm because all of us who are involved are convinced that this is an important work well worth the hundreds of hours devoted to it each month by the 1000-plus volunteers who constitute the boards of the state councils. The enthusiasm with which the program has been greeted in communities all across the nation is demonstrated by the growth of the Endowment's obligations for state programs, which began with an experimental \$587,000 in FY71 and grew in leaps and bounds to \$18,092,000 in FY76 when the reauthorizing legislation included state programs and designated that they have at least 20% of the program funds available to the Endowment.

With the establishment of all the programs and increasing constraints on the Endowment's budget in the past four years, state program obligations have in-

creased only 16% over the total four-year period, but another index of the favorable reception which the program has received has continued to rise; that is the funds which the Endowment has received as gifts for state councils. The first \$14,000 of such gifts was received in FY73, and since then we have seen a 13,307% increase to \$1,877,217 in FY80. This does not constitute all the funds which state councils have raised from non-federal sources. Some donors will not give the funds through the federal government, and many state councils have received gifts beyond the amount which the Endowment can match. None of those moneys is reflected in the Endowment figures.

Funding History of State Humanities Programs

Fiscal Year	Number of State Programs	NEH Obligations	Gifts Received by NEH for State Councils
71	6	\$ 587,000	\$ 0
72	17	2,216,000	0
73	32	5,160,000	14,000
74	41	7,568,000	67,000
75	50	13,529,000	80,000
76	50	18,092,000	450,500
77	51	18,978,000	738,730
78	51	18,500,000	1,407,647
79	52	20,678,500	1,898,408
80	52	21,081,074	1,877,217

All of this sounds comfortably sanguine and might be taken as support for the point of view that the private donor can take over the financing of this program. Unfortunately this is not the case. You will see by the chart above that even with the enthusiastic increase in gifts, they still equal less than 10% of the Endowment's obligations to the program in FY80. The fact is that strong federal support for state humanities programs will be crucial at least through the current authorization period, which extends to 1985.

We are finding that a certain basic support structure is required to develop, operate, evaluate, and administer a state humanities program. That structure is not large, and includes a staff of four to six persons in most cases, but it costs between \$125,000 and \$175,000 per year. With the cuts proposed for FY82 and the formula for distributing funds to state humanities programs built into the legislation it is very doubtful if any program would receive as much as \$200,000 in total. This would be truly crippling to all state councils, even the smallest ones, but it would be devastating to our programs in the largest states.

Though all these programs are growing stronger by the year, they are still in the developmental stage where they need strong structural support to maintain their strength and quality. We must remember that they are a concept which is only ten years old in the oldest program and much younger in most.

Another important characteristic of state humanities programs is that they do not operate permanent programs. In each case the program is a new kind of event which is proposed to the state council, carried out, and usually not

repeated. In cases where programs are repeated, in other places or other years, the eventual funding for any continuation beyond two or three years must come from some other source, not from the state humanities council. This means we are dealing continually with the tasks of developing new ideas, teaching new proposers what they need to do to qualify for humanities funds, helping them in many cases learn to put on a program which will bring the public to participate. If we were operating through established institutions, with programs which could be in place for months or years, or could be repeated many times, our task would be considerably simpler, but the creativity which has characterized state humanities programs throughout their lifespan would be absent.

One of the major strengths of the state humanities programs has been this creativity which has encouraged the people of every community in the nation to put together an idea of how the people there might get together to learn about history or philosophy or literature, or to discuss matters which concern them using the techniques of thought and consideration which the historian or the philosopher can help them acquire. I cannot see how this creativity can be continued under the restraints of a 50% reduction of the Endowment budget. The only sort of program which has any likelihood of being mounted by the fifty-two state councils would be the circulation of pre-packaged national programs to the largest cities in each state--certainly not the sort of broad-based community participation which is present now.

The abilities of state humanities programs to secure non-federal support vary widely, both because of the relative maturity differences in the various programs and because of the great variety of resources within the several states. Some are well supplied with private and corporate foundations, with the headquarters of corporations, and other traditional sources of support for education, but others have few resources available, either corporate or foundation. The most effective way of securing non-federal support most state councils find is encouraging grant projects to get their own community support and assisting them to do so. We serve, as it were, as a certifying mechanism by which private, corporate, and foundation donors can be assured that a proposal has been examined by people able to determine whether it will produce an effective project. The keys to being such a certifying mechanism are, of course, the support system to do that certifying and the funds to make the initial grant.

Often we find ourselves raising funds from new sources each time, because of the non-repeat characteristic of our programs. Funds raised this way are more costly in time and effort required to secure them.

The example of my own state, West Virginia, is the one with which I am most familiar. In the first six years of our program, we awarded 186 grants to 116 different community, governmental, and educational organizations and agencies. With these grants, programs were carried on in 77 communities in 42 of our state's 55 counties, and an additional nine counties were reached by radio and television programs. We estimate that individuals were reached by our programs over that six year period more than three million times, which is a record of which we are extremely proud in a state of less than two million population. Our highest award was \$22,000 for a film which we wear out regularly from repeated use, but we were also able to put on a good program for as little as \$317, because our dollars in each case are the catalytic dollars which make a program happen. Very often the sponsor can command considerable community resources of talent and facilities and ideas, but the

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extra cash which is needed to turn them into a public humanities program is the part which our state humanities council has been able to supply. The impetus to thinking about doing this sort of adult education program in the first place is supplied by our board and staff members as they work throughout the state talking to groups and people about ideas, making suggestions, assisting people in writing grant proposals (often their first), putting people with ideas and community resources together with humanities scholars and helping them all learn better how to go about this business of educating adults (who are only coming if and when they want to come, only if and when the effort is worth while for them).

Perhaps you would be interested to know some of the programs we of the Humanities Foundation of West Virginia have been proud to be part of. The film of which I spoke, which we have replaced several times already, is called "Mountain People: A Sense of Place", and deals with what people believe they gain and what they give up when they live in the mountains, and why they think those gains and sacrifices are important. It is a beautiful and thought-provoking film, for which we have a discussion leader guidebook, so that community people can take the film and the book as starting points for their own discussions of what they think they gain and give up as a result of living in West Virginia's mountains. Whether we are aware of what we gain, and whether we willingly make the sacrifices, makes a great deal of difference in whether our communities in West Virginia are strong and vital or whether they are not. Do we do what we do because we want to and believe in doing it, or are we doing it because we are pushed into it by outside forces we cannot resist or control? This makes a great difference in how we see our lives.

Another program of which we are extremely proud focused on Kanawha County at the time it was polarized by the text-book disputes of the mid-70s. The situation had deteriorated to the point that the opposing sides could not meet without violence and at least one bombing had resulted. The basic issue is one which is still with us: who is to control the curriculum of the public schools? Many parents and community leaders in that county were convinced that they had no alternative to violence in changing what they saw as improper and harmful material being used to instruct their children. An equally convinced group of community leaders was sure that the materials being used were the ones which should be used. I am sure the situation is a familiar one to all of you. We do not think that the project we funded was the whole solution, but we do know that it helped. Some people who were convinced of the value of getting together and talking about mutual concerns, with help from us and from some specialists in conflict resolution techniques, managed to get a number of the leaders of both sides to sit down over a rather long period of time and discuss the history and ramifications of their concerns, ending with two consecutive 12-hour days broadcast live on public television. As I said, that did not provide the whole solution, but the fact that the leaders of the polarized groups could be seen by anyone who turned on his TV to be sitting and talking and working through their problems in the same room was bound to affect the viewers' perceptions about how things could be accomplished, and it was frankly a minor miracle to many of us who very much doubted that it could be pulled off.

Recently we granted planning funds to a major cooperative effort of the State Department of Culture and History (in Charleston), to our largest historical museum (in Wheeling), and to our largest art museum (in Huntington) to produce a major exhibition on the history of life in the coal mining communities of West Virginia. Strangely enough, this has never been done, because our mining

communities tend to look down on themselves as the world has taught them to do. The exhibition expects to raise several hundred thousand dollars in private contributions and already has the cooperation of both the coal industry and the United Mine Workers. The exhibition will be shown in each of the institutions in turn, and then will be divided--part to go to the permanent museum collection of the State Cultural Center in Charleston and part to be circulated as a traveling exhibit to coal communities large and small throughout West Virginia. We are pleased to have helped with the formation of the Coal Life Project which holds much promise of helping people in our state review many important events in their own lives and those of their families and see how they have benefited the community, the state, and the nation.

All this is well and good, but what is the reason the federal government needs to pay for it? I can give several reasons.

The first one is that the federal government thought it up and started it, and has some obligation to see that it is soundly on its feet before turning it to its own resources.

The second one comes from the purposes of the legislation setting up the National Endowment for the Humanities, which said that the Congress recognized, among other things:

...that democracy demands wisdom and vision in its citizens and that it must therefore foster and support a form of education designed to make men masters of their technology and not its unthinking servant...

...that the world leadership which has come to the United States cannot rest solely upon superior power, wealth, and technology, but must be solidly founded upon worldwide respect and admiration for the Nation's high qualities as a leader in the realm of ideas and of the spirit....

It is these purposes to which the state humanities councils are devoting their efforts, at the request of the Endowment and of the Congress.

The third is less tangible, but no less important. It has been pointed out that the debates that went into the making of this American democracy were concerned not just with its institutions and governing principles, but also with the capacity of human beings to sustain those institutions and principles. It is crucial that the people of a democracy themselves understand what it means to hold the ultimate power of society and that they have enough of a sense of history and destiny to know where they have been and where they ought to be going. Thomas Jefferson knew that the developed mind is the best assurance that this political system can be made to work--a system based on the informed consent of the governed. If this idea fails, then all the saved tax dollars in the world will not be enough to prevent this nation from turning on itself.

The federal government's first responsibility is to see that democratic government is maintained. The primary responsibility of state humanities councils is to build those developed minds and that informed consent upon which democratic government rests. The state humanities program is not a huge program, it is not an expensive program; but it is important that the program have federal support.

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Page 6CURRENT NEH GRANTS TO STATE HUMANITIES COUNCILS
AND EFFECTS OF PROPOSED BUDGET REDUCTIONS

State Humanities Councils	Current NEH outright grant award (one year)	Max. estimated grant under proposed budget reductions	% reduction from current grant under proposed bud- get reductions	Current Gifts & Matching Authorizations ¹	Budget for program development, tech- nical assistance, education and administration ²
Connecticut Humanities Council	\$178,000	\$200,000	47.1%	\$150,000	\$125,800
Illinois Humanities Council	562,000	200,000	64.4	250,000	171,600
Kentucky Humanities Council	387,000	200,000	48	30,000	128,700
Michigan Council for the Humanities	516,000	200,000	61.2	125,000	157,800
Minnesota Humanities Commission	398,000	200,000	49.9	100,000	127,900
Missouri Committee for the Humanities	418,000	200,000	52	30,000	128,400
New York Council for the Humanities	709,000	200,000	71.8	250,000	214,700
North Carolina Humanities Committee	434,000	200,000	53.9	80,000	133,200
Pennsylvania Humanities Council	581,151	200,000	65.5	150,000	177,300
Committee for the Humanities in Alabama	\$373,000	\$200,000	46.45	\$ 15,000	\$125,300
Alaska Humanities Forum	396,000	200,000	49.4	300,000	127,600
Arizona Humanities Council	344,000	200,000	41.9	30,000	122,400
Arkansas Endowment for the Humanities	358,000	200,000	44.1	190,000	123,800
California Council for the Humanities	829,138	200,000	75.6	490,000	249,000
Colorado Humanities Program	375,042	200,000	46.7	100,000	125,508
D.C. Community Humanities Council	324,000	200,000	38.3	10,000	120,400
Delaware Humanities Council	309,000	200,000	35.3	60,000	116,300
Florida Endowment for the Humanities	502,000	200,000	60.2	50,000	153,800
Georgia Endowment for the Humanities	390,680	200,000	48.8	10,000	127,680
Hawaii Committee for the Humanities	378,000	200,000	47.1	110,000	125,400
Association for the Humanities in Idaho	328,000	200,000	39	85,000	120,800
Indiana Committee for the Humanities	430,000	200,000	52.5	230,000	132,300
Iowa Humanities Board	342,000	200,000	41.5	50,000	122,000
Kansas Committee for the Humanities	362,000	200,000	44.8	45,000	125,200
Louisiana Committee for the Humanities	398,000	200,000	49.8	280,000	127,800
Maine Council for the Humanities and Public Policy	333,000	200,000	39.9	28,000	121,300
Maryland Committee for the Humanities	402,000	200,000	50.2	280,000	128,300
Massachusetts Foundation for Humanities and Public Policy	439,000	200,000	54.4	28,000	134,500
Mississippi Committee for the Humanities	363,000	200,000	44.9	38,000	124,300
Montana Committee for the Humanities	323,682	200,000	48.1	23,000	121,382
Nebraska Committee for the Humanities	344,000	200,000	41.9	28,000	122,400
Nevada Humanities Committee	323,000	200,000	38.1	38,000	128,300
New Hampshire Council for the Humanities	333,540	200,000	48	18,000	121,540
New Jersey Committee for the Humanities	474,000	200,000	57.8	175,000	145,200
New Mexico Humanities Council	336,000	200,000	40.5	25,000	121,400
North Dakota Humanities Council	323,000	200,000	38.1	200,000	129,300
Ohio Program in the Humanities	581,000	200,000	63.7	280,000	168,300
Oklahoma Humanities Committee	374,000	200,000	46.5	180,000	125,400
Oregon Committee for the Humanities	371,683	200,000	46.2	82,000	125,179
Fundacion Puertorriquena de las Humanidades	381,000	200,000	47.5	20,000	126,100
Rhode Island Committee for the Humanities	330,000	200,000	39.4	75,000	121,000
South Carolina Committee for the Humanities	374,000	200,000	46.5	70,000	125,400
South Dakota Committee on the Humanities	324,000	200,000	38.3	159,000	128,400
Tennessee Committee for the Humanities	407,000	200,000	50.9	160,000	128,700
Texas Committee for the Humanities	602,000	200,000	66.8	300,000	183,600
Utah Endowment for the Humanities	318,000	200,000	37	48,000	119,800
Vermont Council on the Humanities and Public Issues	320,000	200,000	37.5	58,000	128,000
Virginia Foundation for the Humanities and Public Policy	425,000	200,000	52.9	128,000	139,500
Washington Commission for the Humanities	488,000	200,000	58.7	250,000	148,800
Humanities Foundation of West Virginia	387,403	200,000	48	50,000	122,748
Wisconsin Humanities Committee	414,000	200,000	51.7	30,000	129,400
Wyoming Council for the Humanities	318,000	200,000	37.1	20,000	119,800

1. Half raised locally, half additional Federal funds.

2. Figures arrived at from NEH formula: \$85,000 or 20% of the outright grant, plus \$3,000 for retired persons, plus 75% of out-
grant for program development; this budget may be supplemented by local funds.

Federation of Public Programs in the Humanities, February 1981

NEH GRANTS AND GIFTS SUBMITTED: STATE HUMANITIES COUNCILS, 1980
(with partial estimated grants for FY 1982 under proposed 50% reductions)

First Op'ing Grant	STATE	% of total popul. (see note 1)	Rank	1980 Outright Grant Authorized (see note 2)	Rank	Per Cap (¢)	Per Cap Rank	1980 Match Offered By NEH (see note 3)	1980 Gifts Submitted to NEH (see note 4)	Partial Estimated FY 82 Outright Grant Under 50% Reduction (see note 5)
10/74	ALABAMA	1.69	22	\$373,000	30	10	32	\$ 7,500	\$ 2,250	\$223,000
5/72	ALASKA	.18	52	396,000	21	98	1	150,000	174,079	217,000
3/74	ARIZONA	1.10	31	344,000	36½	14	23	15,000	9,619	221,000
6/75	ARKANSAS	.98	34	358,000	31	16	19	95,000*	71,868	220,000
6/75	CALIFORNIA	10.16	1	820,136	1	4	52	225,000	218,410	261,000
2/73	COLORADO	1.24	29	375,042	27	14	24	50,000	28,781	221,000
12/73	CONNECTICUT	1.39	25	378,000	25½	12	28	75,000	26,250	222,000
6/73	DELAWARE	.26	49	309,000	51	53	4	30,000	27,083	217,000
12/79	D.C.	.29	48	324,000	45½	49	5	5,000	4,250	217,000
5/72	FLORIDA	3.96	8	502,000	8	6	45	25,000	-----	233,000
2/71	GEORGIA	2.29	14	390,660	22	8	42	5,000	-----	226,000
3/73	HAWAII	.41	41	378,000	25½	41	10	55,000	77,867	218,000
10/73	IDAHO	.40	42	328,000	44	36	12	42,500*	43,250	218,000
3/74	ILLINOIS	5.03	5	562,000	5	5	48	125,000	94,178	238,000
9/72	INDIANA	2.42	12	430,000	13	8	40	115,000	149,708	227,000
5/72	IOWA	1.30	27	342,000	38	12	29	25,000	33,579	222,000
6/72	KANSAS	1.06	33	362,000	33	15	20	72,500	8,568	221,000
6/73	KENTUCKY	1.58	23	391,000	23	11	31	15,000*	2,500	223,000
4/72	LOUISIANA	1.80	20	398,000	20	10	33	100,000	73,896	224,000
6/75	MAINE	.49	39	333,000	42	30	14	10,000	6,000	218,000
10/74	MARYLAND	1.86	18	402,000	18	10	35	100,000	75,000	224,000
6/75	MASS.	2.58	10	439,000	11	8	43	10,000	-----	227,000
10/74	MICHIGAN	4.12	7	516,000	7	6	46	62,500	44,642	234,000
8/71	MINNESOTA	1.82	19	399,000	19	10	34	50,000	24,656	224,000
10/72	MISSISSIPPI	1.08	32	363,000	32	15	21	15,000	12,456	221,000
2/71	MISSOURI	2.18	15	418,000	15	9	38	15,000	11,488	226,000
10/72	MONTANA	.35	44	333,682	40	42	9	10,000	15,655	218,000
7/73	NEBRASKA	.70	36	344,000	36½	22	17	40,000	38,100	219,000
5/72	NEVADA	.31	45	323,000	47½	46	8	25,000	29,885	217,000
10/73	NEW HAMPSHIRE	.40	43	333,640*	41	38	11	5,000	-----	218,000
2/73	NEW JERSEY	3.28	9	474,000	10	6	44	87,500	50,005	230,000
6/73	NEW MEXICO	.56	38	336,000	39	27	15	12,500*	-----	218,000
9/75	NEW YORK	7.90	2	709,000	2	4	51	125,000	56,058	251,000
3/72	N. CAROLINA	2.51	11	434,000	12	8	41	40,000	15,675	227,000
6/73	N. DAKOTA	.29	47	323,000	47½	49	6	100,000	116,556	217,000
2/72	OHIO	4.80	6	551,000	6	5	47	100,000	98,967	237,000
4/71	OKLAHOMA	1.29	28	374,000	28½	13	25	90,000	24,365	222,000
3/71	OREGON	1.13	30	371,683	31	15	22	40,000	17,533	221,000
6/73	PENNSYLVANIA	5.25	4	581,151	4	5	49	75,000	82,260	239,000
6/75	PUERTO RICO	1.50	24	381,000	24	11	30	10,000	15,800	223,000
4/73	RHODE ISLAND	.42	40	330,000	43	36	13	37,500	19,808	218,000
8/72	S. CAROLINA	1.31	26	374,000	28½	13	26	35,000*	26,850	222,000
4/72	S. DAKOTA	.31	46	324,000	45½	47	7	75,000	86,350	217,000
9/73	TENNESSEE	1.96	17	407,000	17	9	36	50,000	34,268	225,000
10/73	TEXAS	5.99	3	602,000	3	4	50	150,000	124,067	242,000
7/75	UTAH	.61	37	318,000	50½	23	16	20,000	15,509	219,000
9/73	VERMONT	.22	50	320,000	49	65	3	25,000	33,384	217,000
8/74	VIRGINIA	2.33	13	425,000	14	8	39	60,000	14,548	226,000
10/72	WASHINGTON	1.76	21	485,000	9	12	27	125,000	129,907	224,000
5/74	W. VIRGINIA	.84	35	357,403	35	19	18	25,000	14,000	220,000
3/72	WISCONSIN	2.11	16	414,000	16	9	37	15,000*	10,769	225,000
2/71	WYOMING	.20	51	318,000	50½	71	2	10,000	10,700	217,000

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NOTES

Note 1: The population figures are based on Estimates of the Population of States: July 1, 1978 and 1979 (Advance Report), a chart issued in November 1979 by the Bureau of Census. The figures represent the Bureau's provisional estimate of the population as of July 1, 1979. The 1980 grants were calculated on the basis of the 1979 estimate.

Note 2: The amount of the award is based on the congressional appropriation to the Division of State Programs and the Census Bureau's estimate of the population which is in effect at the time the proposal is reviewed. These quantities are introduced into the staff's calculation in the course of normal preparation for the review; they are specified by percentages defined in the 1976 legislation and by other legislation pertaining, e.g., to dispensations for extra-continental states and territories, etc.

According to the formulation in the 1976 legislation, the amount appropriated to the Division of State Programs is distributed as follows. First, 25% of the total definite funds available for the O.S.P. is reserved for use by the NEH Chairman. (Most of this, evidently, is made available to the states with approved proposals, on the basis of their population.) Then, the 75% which remains is divided by the number of qualifying entities. In the 1976 law, four outlying territories (Guam, Northern Marianas, Virgin Islands and American Samoa) are included in the count of states, as are Puerto Rico and the District of Columbia. The number of eligible entities is therefore 56. The amount resulting from the division of the 75% by 56 is the sum to be awarded equally to each applicant with a proposal approved by the Chairman.

Next, if a proposal is judged to be fully satisfactory after being assessed in the NEH review system, the state council will receive an extra amount in addition to the minimum sum. The maximum of this extra amount is a percentage of the 25% of the total O.S.P. definite funds reserved for the Chairman, equal to the percentage of the total national population which resides in that state, as determined by the applicable Census Bureau estimate. (Not all of the 25% fund is made available to the state councils; some is used for programmatic activities of the Division of State Programs, such as special conferences and contracts, and for mandated dispensations for Alaska and Hawaii and outlying territories.)

Note 3: Under the 1976 legislation, each council submitted annually a request that treasury funds be set aside and marked for release to that state council, upon submission to NEH of eligible gifts received by that council. The request is based on the council's judgment of its needs and the size of its contributions; the authorized match (shown here) is set by the NEH National Council and Chairman on the basis of their determination of the state council's needs, the likelihood that the projected sum will be raised, and on the availability of funds. The eligible gifts submitted are matched 1 - for - 1 out of the NEH match offer; both the matching funds and the submitted gifts are returned to the state council.

The asterisks indicate that a supplement, requested and authorized in the most recent 12-month grant period, has been added to the amount originally authorized.

Note 4: These are the recorded amounts of gifts submitted by the state councils to NEH for match during FY 1980 (i.e., between October 1, 1979 and September 30, 1980). These figures do not represent all gifts received by the state councils during that period; many state councils do not submit received contributions for match immediately upon receipt of the gift. [The figures for gifts received by the states but not submitted in this period are not available.] Nor do these figures represent all submissions to be matched out of the FY 1981 Treasury funds appropriation to NEH. This is because in 1979 and 1980, NEH's Gifts and Matching offers were held open, on notification by a state council that gifts had been pledged; in these cases the offers were not closed until the pledges were realized and submitted for match. Thus some of the gifts included in the sums shown in this column are matched by FY 1979 G and M Treasury funds.

Note 5: These are estimates of partial outright grants for FY 1982, based on (a) the 1980 legislation (PL 96-496) and (b) the proposed 50% reduction in NEH FY 1982 appropriations. The 1980 formula for distributing available funds provides, first, that \$200,000 shall be designated for each eligible entity. NEH identifies 56 eligible entities for the purposes of the FY 1982 calculations. After this total (i.e., \$11,200,000), is subtracted from the total funds available for state programs (budgeted at \$13,200,000), the excess is distributed in three steps: (i) 44% of the excess is distributed equally among eligible grant recipients; (ii) 22% of the excess is distributed according to the percentage of total population residing in each state or territory; (iii) 34% of the excess is distributed by the Chairman, according to criteria to be determined and announced in the near future. The figures in this column include the \$200,000 to each council, \$16,000 to each (shares of the 44%), and a variable sum determined by that state's population. The amount which might go to each grant recipient out of the 34% excess is not estimated in this column. Thus, again, the figures in the column are estimates, and they are estimates of part of the possible FY 1982 outright grants to these councils.

It should also be noted that no attempt is made here to estimate the amount to be offered by NEH to match gifts to the state programs in FY 1982.

STATEMENT OF BERTRAND W. GREEN

Mr. Chairman and Members of the Committee: I am pleased to have this opportunity to address the Committee. The President's Budget Reform Plan proposing a 50 per cent reduction in the original fiscal year 1982 appropriation request for the National Endowment for the Humanities will strike a severe blow to many vital humanities programs throughout the country.

I will not attempt to define the humanities—that has been done before. I will not attempt to discuss what the humanities should seek to accomplish—this too has been discussed many times from different perspectives. I will, however, speak to the role the humanities, with NEH support, have played in creating for Lehman College and the surrounding community a sense of place in the complex region of New York City called the Bronx.

Lehman College is in a region that includes southern Westchester County and the Bronx—New York's poorest borough and the only one with more than 50 percent minority population. Many of our 8,400 undergraduate students are in the lowest economic bracket and receive various forms of financial aid to support their studies. Approximately one-third Hispanic and one-third Black, the student body reflects the ethnic and economic diversity of the Bronx. The average age of our students is about twenty-five years, which is slightly older than the "typical" college undergraduate. Since Lehman is a non-residential college many of our students are members of the surrounding Bronx community and identify with it.

Because of the background of many of our present students, Lehman developed in 1977 a program whose principal goal was enrichment through exposure to the Humanities and to the Arts. With the support of the NEH, The City and the Humanities program was born. The uniqueness of our program is best illustrated in the original statement of the objectives of the program:

"Most urban studies program are sociological or political in emphasis. Ours focuses on the humanities, on the city as site, source, and guardian of human culture throughout the ages. Our students—academically under prepared and economically disadvantaged through many of them are—can learn to recognize and lay claim to the culture that is their heritage as residents of New York City. Themselves city-dwellers, they can appreciate the role of cities in the past and better appreciate their own present. From a set of introductory lectures on 'The City of History' to a program of internships for advanced students, our program is designed to enhance the attractiveness of the humanities at Lehman and their influence of our students' future lives."

Today, the program offers a dozen courses, some with several sections, with a student registration of over 500. Two fieldwork courses continue to produce original work including a brochure on "Apartment Houses in the Bronx" and a brochure on "Public Buildings in the Bronx," both produced by the teachers and students in the course "Photohistory of the Bronx". All evaluations of the program by students, community participants, College administrators, and NEH teams rate the program as excellent. The program rests on a solid base of support from the college administration. Without continued NEH support the program will lose much of its substance.

COMMUNITY OUTREACH

One of our operational principles has been to involve members of the Bronx community in our programs. An administration evaluation of the program reports that "citizens from the surrounding community, especially senior citizens, attend in large numbers the lectures and concerts of the one-credit introductory course, evidence that the program continues to offer attractive intellectual and artistic fare to the neighborhoods of our borough." Senior citizens comprise the largest community group drawn to our campus on a regular basis. They feel welcome and special. Their many letters of appreciation for being included in the program attest to that. They mingle with the students in our classrooms and raise questions about the history and culture of the region they share with the students, and about their different experiences and perceptions, differences that are not only generational but cultural. They are encouraged to feel that they come to us not only to receive but, because each of them is a repository of knowledge, they can make a unique contribution to the social history of New York City.

Last year, we sponsored two large-scale community events on Lehman's campus and, at one, ten community groups responded to our invitation and participated in a celebration of the "Arts of the Bronx". One of the main magnets drawing community residents to the campus is the new \$50 million 2,300 seat Lehman College Center for the Performing Arts. Our future plans include the full utilization of this new facility. For example, a conference on "The Folk Culture of the Bronx" will be held

at Lehman on May 16-17, 1981. It will be sponsored jointly by the City and the Humanities Program and the New York City Chapter of the New York Folklore Society. The conference will focus on how traditional activities as music, dance, storytelling, and ritual reveal the nature of the "affective bond between people and a place or setting" in a multi-ethnic region within a metropolitan area. Participants in the conference include both scholars and members of Bronx communities. One of the goals of the conference is to stimulate future cooperative efforts, and to enhance the self-image of the participating communities and their receptivity to the efforts of Bronx institutions to serve them. Appendant to this testimony is supportive documentation illustrating Lehman's community outreach and the responses of Bronx and Westchester communities to the programs.

A part of Lehman's community outreach mechanism has been a series of meetings with community leaders and representatives in the Bronx in order to identify groups and individuals who will work with us. As a result of this dialog, a Board of Advisors has been organized consisting of humanists, academicians, and community leaders. There has been a structural weakness in developing productive leadership. We are forging new relationships between the community and academia. The need is apparent. The NEH provides the means to meet that need. We are not attempting to re-invent the wheel. What we are attempting is to provide for our community a sense of place in the space that we both share. Through innovative program designs both the College and the community will be able to broaden each of their horizons and see that we are inextricably interrelated.

ETHNIC AND ORAL HISTORY

Our program offers two courses designed to explore the rich ethnic heritage of New York City. "Hispanic Folklore in New York City" is the only course in the program taught in Spanish and its students are a representative sample of the steadily growing Hispanic population of the city and of the college. One of the objectives of the course is "to study Hispanic ethnic groups and the continuity of their folklore and ethnic identity within the extraordinarily heterogeneous setting of New York City." The research resulting from their fieldwork projects provides needed information about the degree of acculturation of the Hispanic community.

The other course, "The History of Blacks in the City," focuses on the social history of blacks in the boroughs and suburbs of New York City. The students are actively participating in the making of history by recording on tapes the experiences of black senior citizens and, by photographing buildings and sites of historic interest, they are creating new dimensions to the oral and pictorial history of black communities. Although oral history is thought of as a modern technique, the importance of eye-witness accounts was clearly seen by Flavius Josephus in ca. 70 A.D.:

"To place on record events never previously related and to make contemporary history accessible to later generations. Genuine research consists not in mere rearrangement of material that is the property of others but in the establishment of an original body of historical knowledge."

Because of the absence of sufficient materials, oral history is becoming an increasingly important tool in the reconstruction and recording of black history.

Approximately fifty students have completed this course and copies of their projects have been given to several local public libraries. One notable example is a 200 page two volume study entitled "Voices and Profiles of New Rochelle's Rich, Color-Full History." This is the first systematic research conducted on the city's black population.

This study has had an enormous impact on the community as illustrated by the attached full page feature story in New Rochelle's newspaper *The Standard-Star*. I feel that the effect the study has had on the student is equally important:

"This research project has significantly added to my academic growth and development in several ways. Firstly, the entire project involved oral history or a survey research technique which I had not previously utilized. The result was that I was introduced to a data collection method which was found to have great value in historical investigations. The quality of the information yielded by the interviews and tape transcriptions could not have been achieved through the use of standardized, objective data collection instruments. Therefore, I feel that I have benefited by being introduced to, and becoming familiar with a valuable research tool. Secondly, I noted a discernible improvement in my interviewing skills as I reviewed tapes which were made at the beginning and conclusion of the research project. Thirdly, the project was helpful in preparing me for my career goals since I am a Speech and Hearing Major, with a minor in Special Education. The interviews were extremely helpful in that they afforded me an opportunity to increase my sensitivity in working with a wide range of individuals . . . who had extremely diverse points-of-view about the same geographical area, and the same residents of the New Rochelle

community. This helped to crystalize my understanding of how different individuals may perceive basically the same data and situations. The project helped to sharpen my sensitivity, and increase my awareness about the dynamics of communities, and the perceptions and feelings of individuals within those communities.

The research project has added to my personal growth and development by expanding my knowledge about myself, other members of my ethnic group and of my community. The personal interviews have given me a better understanding of myself as a Black, and has placed into better historical perspective some of the problems and pressures which were experienced by my ancestors. I was able to relate many of those experiences to present day occurrences. The interviews also, in a sense, helped to explain many of my own personal characteristics which were previously unclear to me. As an example, the whole question of domestic work, which I had always found personally objectionable, takes on a different meaning when one speaks with (interviews) some of the most intelligent, personable and proud people imaginable only to find that they too had to do domestic work in order to survive in an economy that had forced them into that role. It was also gratifying to hear from people like Mrs. * * * that her parents had carefully and systematically taught her the importance of doing honest work, with integrity, in order to meet her needs and achieve her objectives."

This clearly illustrates the importance of ethnic oral history research and the role of this course as a catalyst in generating a new spirit of cooperation between the community and academia.

The President's proposed fifty percent reduction in the original fiscal year 1982 appropriation request of the NEH will gravely affect creative and productive programs in educational institutions around the country. The NEH budget represents less than one-eighth of one percent of the Federal budget. This is but a small investment when we consider the benefits of such an investment, namely, the creation within our problem-ridden urban centers of a sense of respect for humanity and the humanities, and a desire to preserve rather than to destroy our common cherished heritage. Our City and the Humanities program at Lehman, like other similar ones, helps the community as well as the College to understand better its sense of place in New York, America, and the World.

I hope that this committee will recommend granting the NEH the support it requests. Thank you.

Ms. Tuchman just gave me some quotes from the Rubaiyat of Omar Khayyam. She is right in giving us this quote. It says: "Make the most of what we yet may spend before we, too, into the dust descend."

Ms. McCREIGHT. Mr. Chairman, I appreciate the opportunity to come. I am Betsy McCreight. As is Mr. Davis, I am also a beneficiary of the National Endowment of the Humanities but of a different variety.

I am president of the Association of State Humanities Programs and have spent eight years as a board member of the Humanities Foundation of West Virginia, a State humanities council.

I have also served on various other boards that have to do with the educational enterprise at various levels and on boards that have to do with health and welfare. So I am not unaware of the various varieties of problems.

The first thing I would like to echo in several peoples' comments is that 50 percent is too much.

They say that when you have only a hammer, you treat everything as if it were a nail. I think maybe we only have a cleaver working here, and everything is treated as a side of beef.

But certainly a 50 percent cut for the National Endowment for the Humanities is not a cut. It is an attack on the philosophy of the agency. It seems to me that this philosophy was demonstrated. There was great support in the reauthorization of the endowment this past year. There was testimony of many sorts and endorsement of the endowments' aims and purposes and goals.

I did not notice that there was any testimony during the reauthorization period of a great need to revise the National Endowment for the Humanities in the way that this cut would provide.

Mr. YATES. Supplementing what you just testified to, I notice the speech that President Reagan made last Friday night to the Conservative Political Action conference in which he concluded with the statement:

Our goals complement each other. We are not cutting the budget simply for the sake of sounder fiscal management. This is only a first step toward returning power to the states and communities. It is only a first step toward reordering the relationship between citizen and government. We can make government again responsible to the people but only by cutting its size and scope and thereby ensuring that its legitimate functions are performed efficiently and justly.

It seems to me that is a philosophy rather than a mere wielding of the axe.

Ms. MCCREIGHT. I think there is no question in this budget action. It seems to me that the Administration is making several points and my testimony has some discussion of that, which I won't go into all of. But there are several of them I would like to mention.

One is that they make the point that we need to cease expanding the influence of the arts and the humanities endowments into various broader segments of the life of this country.

I would like to call to your attention a letter which I received in the mail this last week from a man named Mark Harshman of Moundsville, West Virginia. Moundsville is a community of about 12,000 souls on the Ohio River. Mark had a grant from the Humanities Foundation in West Virginia for \$330*big government spending.

He says:

The influence of the arts and humanities represents a contribution to the community more important than even food or employment. I realize this may seem preposterous, but I hope that you will recall, as I do, past concerts or lectures or readings, those special moments when the right words or the quiet ring of a fading banjo not only inspired you but offered you for your next day something which I can only describe as sustenance. We are, indeed, to face some lean times in the coming years. We can, and must, all do with less. But to do without the ideas and inspiration of our artists and scholars is to risk breaking not the body of the people but their very spirit.

I think that is the sort of thing we have all been talking about today.

I think that State humanities programs have done an extraordinary job in the past ten years in bringing the humanities into the communities of this country, from shore to shore and out into Hawaii and Alaska.

They are bringing people back into the life of the mind who are no longer in school and who might not ever come back. It is very important when we try to sustain democracy in this country that we have people who are thoughtful and thinking about the important things that matter to this government and to us as a people.

Another point that the Administration made is that these endowments are the patrons of the first resort. As far as the State humanities councils go, they are the patrons of the only resort. I think they have served a function to begin things, which would not have started otherwise. Certainly State humanities councils are that sort of enterprise.

If it hadn't been for the National Endowments for the Humanities and the Congress, there would not have been any State humanities councils. I think that the nation would be less rich for them.

As Mr. AuCoin pointed out, these councils are providing, as the National Endowment does, certification to private donors. In particular, corporations are beginning to make donations to this sort of activity. But they are not in a position to make the determination of whether or not it is a wise gift. They have many different kinds of projects asking for their support.

To decide whether a humanities endeavor is a wise expenditure of money and whether it is going to come across, takes a fairly sizable amount of expertise to determine. State humanities councils are providing that expertise to private donors. If there is a small donation from the state humanities council to a project, then the corporate donor can know that somebody who knows a little about what they are doing has taken a look at it and decided that it is a good scholarship, that they know what they are doing, and that they know how to put on a program.

Sometimes we don't always judge correctly, but we do the best job that we can, and a better job than is available anyplace else.

This is the only place where private donors can go for this sort of certification, or whatever you want to call it.

Another example that the West Virginia Humanities Foundation ran into just recently of the influence on private donors is a proposal which we have before a regional foundation for a grant of \$150,000 to start an adjunct activity. It is being received by the staff of the foundation with much enthusiasm.

The week after President Reagan's first budget message to the Congress, I received a telephone call from the staff saying it would not be presented to their board for voting because of the "uncertainty of Federal funding".

There is no question but that this private foundation was anxious to give funds for programs, as long as the basic Federal support for the agency was there. But when they thought that it might be in jeopardy, they were not anxious to even consider it, which is disturbing to say the least. It certainly does not support the point the Administration is making about turning it back over to private enterprise.

You asked last year how the State councils were doing at raising their own money. I can report that in fiscal year 1978, they raised about \$1.4 million which they submitted to the Endowment for Match and the Gifts for Matching Program.

At the present rate of submission for this year, it will be about \$2.5 million. This is sizable growth. This is only the money that they are submitting to the Endowment for Match. There are other funds which are raised which are not submitted for match, either because the State doesn't have any more match to use or because the funds are not matchable for various and sundry reasons.

I think that at long last we are beginning to show a really substantial piece of financing outside the Federal funds.

But I think in order to do this we must keep our basic support mechanism. In each case, this is a staff of about four to six people which the state humanities council provides which not only sup-

ports the grant-making activity but supports the fund-raising activity.

I am sure you gentlemen have been on boards and know that a volunteer can raise money much more effectively if there is good staff support to see that records are kept and the information is secured and that the letters are mailed out and so forth. It multiplies your effectiveness severalfold.

These basic staff supports at the state humanities council have run in expense from about \$125,000 to \$175,000 a year.

In my testimony, you can see the sorts of grants that the State councils are likely to get under this 50 percent cut, a run in the neighborhood of \$225,000 apiece. You can't keep a \$150,000 staff support system if you only have a \$200,000 budget. There is simply no way to do it.

Therefore, our ability to raise money is going to be severely crippled. In many of the larger States, it may be impossible to do anything worth doing for \$200,000 a year. It would be probably just throwing the money out the door.

Mr. YATES. Is the example of the Federal Government cutting its budget likely to be repeated on a State level, rather than see the States increase their budgets to offset the Federal deletions?

Ms. McCREIGHT. As you know, the State humanities councils have no State government funds, except for a few unusual examples. We are non-profit, voluntary organizations entirely. Perhaps four State councils have some allocation from their State governments. There is certainly almost no chance that most State councils will get money from State governments with the present budgetary situation, not to mention the notion that government should not grow.

Our governor told me that there is no way you are going to get into our budget. I said we really didn't want in your budget. He said even if you wanted in, you couldn't get in.

Mr. YATES. Which governor is that?

Ms. McCREIGHT. That is Governor Rockefeller of West Virginia.

Mr. YATES. A disciple of private enterprise then.

Ms. McCREIGHT. That's right.

I think that you gentlemen would probably want to compare the chart of where your State councils are likely to be. The right hand column has the grant under a 50 percent cut and the current grant column shows where they are now.

Mr. YATES. May I interrupt you and go back to Governor Rockefeller for just a moment? I have a good impression of Governor Rockefeller as being an excellent governor of the State of West Virginia and very much of an humanitarian as well and devoted to the arts and humanities.

Ms. McCREIGHT. He will be cosponsoring a conference with us this fall.

Mr. YATES. The point you are making though is that the state budgets just don't permit this kind of addition to offset what the Federal Government deletions would bring.

Ms. McCREIGHT. There is no question of that. Not only are the state funding sources shrinking for all kinds of reasons; but when the other cuts that are being made in Federal Government programs are made, the state budgets will have to pick up matters of

health and welfare in unemployment compensation and a lot of other items which are already in the budget.

When you have a budgetary item that is already there which needs to expand, you are certainly not likely to put a new item in your budget.

We think it is important to realize that many States are operating in their State humanities councils on a per capita allocation. There are 17 States that are operating on less than ten cents per capita of their Federal grant. There are six that are operating on less than five cents per capita.

These are not overweaning expenditures of throwing away money. These are very small amounts that are doing an excellent seed money job and certification job and starting new things.

I think one thing that needs to be said at the outset of the humanities programs is that they do not fund the same thing over and over. Almost every program is a new program. That is more expensive to do. You are trying new things and enticing people back into the life of the mind who wouldn't be there otherwise.

I would like to close with what I understand is called the Number Three Pencil Law. That is: If you make something sufficiently difficult, most people will stop doing it.

I think this is what may happen with the volunteers who are involved in State humanities councils. Many of us will struggle on; but if it gets sufficiently difficult, a lot of people will stop.

Thank you.

Mr. YATES. Thank you.

Ms. MYERS. I am Sondra Myers from Scranton, Pennsylvania.

I come before this committee today as a former member and vice chairman of the Pennsylvania Humanities Council, as a former member of the Executive Committee of the Federation of Public Programs in the Humanities, as one who has served as a panelist for the Museums and Historical Organizations Division of NEH, as a coordinator of and participant in programs which have received NEH funds, but primarily I come here as a Scrantonian—a citizen of a community, a medium-size city—which has been profoundly enriched by the infusion of excellence through grants from the National Endowment for the Humanities.

I might add, parenthetically, that I have a parallel track of interest and service in the arts. I serve as a member of the U. S. Commission of Fine Arts, as President of Citizens for the Arts in Pennsylvania, and as Chairman of the Lackawanna County Commission on Cultural Affairs.

The Scrantons of this nation need the National Endowment for the Humanities.

Mr. YATES. How many Scrantons are there?

Ms. MYERS. A lot of them.

Scranton suffers from what one might call Northeast Syndrome, declining population, high unemployment, an ailing economy, and low morale. If it differs from similar cities in the Northeast, it is in the fact that it has suffered this syndrome longer than most. Until about 1940, it was the capital of the anthracite coal industry. As that industry declined, so did Scranton.

But Scranton lives on and the quality of life in Scranton, despite all its problems—some of them difficult and some impossible to solve—needs to be taken seriously.

Scranton, its academic institutions, its community organizations, its scholars, and its general population need to be linked to and connected with that which gives meaning to our society, which makes sense of the world around us.

The NEH in some very substantial ways has provided that link which is critical to the well-being of Scranton and Scrantonians.

Through the University of Scranton, for example, some \$370,000 has come from the NEH. A Challenge Grant of \$300,000 has generated another \$900,000 in matching non-Federal funds.

As a result of the Challenge Grant, the University has been able to offer to its students—many of whom are from the area and who remain in the area—distinguished humanities faculty and guest lecturers who bring not only to the students but to the regular faculty and community as well a fresh perspective and a new sense of pride.

Not least important, the University of Scranton faculty members have learned from the visitors how well-qualified they are themselves to fulfill their teaching responsibilities. Significant library acquisitions in the humanities have also been made through the Challenge Grant.

Similarly, grants to faculty members for NEH summer seminars have brought currency and vitality, new insights to the tasks at home.

The NEH American short stories series has been brought by the University and used repeatedly in the classroom.

Marywood College and Keystone Junior College have also been able to lift their sights as a result of grants from the NEH. Keystone also received a Challenge Grant of \$100,000 in 1980, as well as 12 other grants, many of which had far-reaching impact on the community.

With the help of the NEH, the public television station, WVIA, and two University of Scranton historians have been able to produce an ethnic series in a place which is rich in ethnic tradition. All told, WVIA has received about \$360,000 in the past six years.

The State humanities program has had an especially significant impact on the community and its out of school public.

In 1976, a coalition of academic institutions and religious and community organizations was formed to present conferences—directed not to the academy but to the community—on issues of public concern. To date, the coalition has produced humanities programs on the following subjects: the Holocaust, human rights, religion in America, energy, and the American dream.

In all cases, local academic and community people have joined forces with nationally and internationally known humanists to present the programs.

In this, Pennsylvania's 300th anniversary year, a program entitled "William Penn's Legacy" has been funded by the State council. The impact of Penn's legacy on the very shape of this nation, on our own Constitution, our religious freedom, our system of criminal justice, and our cultural pluralism is immeasurable. People in Scranton really need to know about it.

To dwell for another moment on the coalition and its programs, here are a few facts.

Each year, more organizations want to join the coalition. Now there are ten.

In six years, the coalition's programs have received only \$50,000 from the State council, a modest sum.

The ripple effects of these community programs have been dramatic: in-service courses for teachers, library acquisitions, and perhaps, most important, the coalition has marked a high point in gown and gown, town and gown, and interreligious cooperation.

There have been other NEH grants in the Scranton area, but I single out the coalition's programs as exemplary for several reasons that speak in support of restoring full funding to the NEH.

First, they are modest programs. The NEH is a modest program.

The red herring of elitism-populism is no issue in them. The aim of the group is to bring programs of the highest quality to the broadest audience possible.

The program combats provincialism and a sense of isolation in the community, bringing fuller understanding of the complexities that befuddle us all.

In my view, the greatest dangers to this nation are ignorance and a sense of helplessness. Political freedom and political responsibility are our greatest national treasure. We cannot promise that life will be simple; that it will be economically or militarily secure. But I think that we can promise, and we need to promise, to help our citizens understand the complexities and live with them and to act intelligently and responsibly in the context of uncertainty. And we can promise it in Scranton, as well as New York or Los Angeles, Cambridge or New Haven.

Mr. GREEN. Mr. Chairman, I am Bertrand Green, a Professor at Herbert H. Lehman College in the Bronx, New York. I teach in the Black Studies Department, as well as in the City and the Humanities Program, which is supported by NEH funds.

We are all, to one degree or another humanists, concerned with the issues which shape our daily lives. The humanities, which includes that body of knowledge of philosophy, literature, and the fine arts, surround all of us daily.

The humanities are often considered, however, the main concern of an educated elite. Significant numbers of our population, especially some of our ethnic minorities, have only a vague or superficial knowledge of the humanities when, in fact, they have often been the inspiration for, and the subject of, much of the humanities' creative work.

Our crowded multi-ethnic urban centers are full of energy—energy that can hopefully be channeled for productive purposes.

At Lehman College we are concerned with generating an awareness of the beauty and the relevance of the humanities.

I gave a profile of Lehman College and the area in which it is located in my testimony. I reported that many of our students are poor, inner-city students. Many of them receive financial assistance, like Mr. Ossie Davis.

Perhaps through a combination of inspiration, coming from the humanities and financial support, we will perhaps have many of

them to follow in the footsteps of Ossie Davis with the support that we can give them.

Attached to my testimony are two folders with supportive materials, letters from community people who have benefited and profited greatly from our programs. I have also included press releases and newspaper reports of the humanities program.

Upon reading much of this material, I think you can see the impact that the program has had, not only on the college but on the surrounding community.

Through our program, as I mentioned before, the City and the Humanities, we are able to present a series of lectures, concerts, and innovative courses designed to stimulate intellectual thought within the college and within the surrounding community.

My primary professional interest is focused on blacks in Africa and in the diaspora. I find that one of the common problems for many urban Afro Americans is feeling a sense of place, especially in the urban setting.

Although there are differences between individuals and there are differences between groups, there are certain common denominators that equalize us all.

General Gavin stressed the importance of knowing about other cultures abroad. One of the characteristics of America is that it is a mosaic of cultures. Unfortunately, most of us are not as aware as we should be of the cultural aspects of our neighbors.

The humanities can provide the medium through which our commonalities can be discovered. Instead of emphasizing our differences, we can perhaps look at the common thread of thought and feeling which runs through all of us.

One of the first steps in writing a social history is identifying the sources of information. A complete picture must include the history of the common people—those who are not rich or famous, whose views seldom get reported in documented history.

Any historical account of American life will be incomplete if it neglects the lives and struggles of the Black population.

Blacks have often been included in regional studies, as statistical extractions. The human aspect has generally been ignored. The Bronx has traditionally been studied with emphasis on either its early historical development or its being a prime example of urban decay. I think everyone knows Charlotte Stree now.

Little attention has been given to the human component in the Bronx. The Bronx has a very rich and colorful cultural history which gives rise to the creation of areas with strong ethnic and cultural identities.

With support from the NEH, my students and I have been able to start research in cultural coexistence and cultural superimposition.

The image of the Bronx is often distorted by the emphasis placed on the devastated areas, as I mentioned earlier. Many of the very poor areas of the Bronx have a large Black population. There are, however, areas in the Bronx that have had stable, middle-class Black property-owning residents for more than 100 years. But this is generally not known.

Because of the absence of certain documented materials, oral history is becoming an increasingly important tool in the recon-

struction and recording of Black history. Much of Afro-American culture has been developed from a system of oral transmissions mainly in songs like the spirituals and the blues, the creation of folklore, and satirical humor.

Oral history is not, as some believe, a nostalgia for the good old days. It is a method used to construct the chronology of the people, their values and belief systems, and their perspective of space, and their place in that space.

Through the method of oral history, a more complete history can be written. By combining the skills of interviewers and the information provided by our community residents, historical records will be supplemented and enriched by, again, the human element. Blacks and other ethnic minorities will feel more positively involved in the making of history.

Many of our urban residents show little respect for the creative efforts of the humanities. This is a national problem, and it requires national support to provide a remedy. This nation cannot abrogate its responsibility to preserve our common cherished heritage and to stimulate through its support future projects.

Any program which seeks to unite communities and strengthen their relationship with educational institutions with whom they share the same space must be supported, not abandoned.

An African proverb is prophetically apropos: "The ruin of a nation begins in the home of its people."

I would like to rephrase that proverb so that I can end my statement on a positive note. Perhaps we should say that the strength of a nation begins in the homes and communities of its people.

I strongly urge the committee to recommend granting the NEH the support that it requests.

Mr. YATES. Thank you all very much.

We will come back at 1:30.

AFTERNOON SESSION

WITNESS

JULIE MOTZ, INDEPENDENT PRODUCER

Mr. YATES. The hearing will come to order.

Miss Motz, glad to see you again. We have a statement of yours which may be made a part of the record.

[The statement follows:]

TESTIMONY BY JULIE MOTZ.PRESIDENT

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It is not without some apprehension that I find myself testifying in support of the administration's proposed budget cuts for the National Endowment for the Humanities and the National Endowment for the Arts. I hope that by the end of my testimony the reasons for both the support and the apprehension will be made clear.

It is interesting to note that in terms of justifying their continued growth, the two Endowments tend to take opposite tacks (and in doing so clearly negate the conventional, vicious slander that there is no difference between them - a point to which I shall return). Those seated around the square table at meetings of the National Endowment for the Humanities talk with dismay of the drop in enrollment in humanities courses in our colleges and universities. The moral: interest in the humanities (or at least in studying it in institutions of higher learning) is down, therefore more money must be pumped into and out of the NEH. Their cousins in the toils of the national arts bureaucracy tend by contrast to talk glowingly of the increased interest in the arts (although not necessarily in the creation of works of art) since the NEA has been in flower. The moral: interest in the arts is up, therefore funding for the NEA must be increased in recognition and perpetuation of the splendid job it has done.

It is tempting to reply to both arguments with equal brevity: the NEH has, by its own standards, failed, and therefore deserves to be put out of business; the NEA has, by its own admission, created a broad level of public and corporate support for the arts, and in the healthy economy which we all look forward to participating in soon, it will no longer be needed. My own feeling is that interest in the humanities and the arts, and the creation of works of

The image of the Bronx is often distorted by the emphasis placed on the devastated areas, as I mentioned earlier. Many of the very poor areas of the Bronx have a large Black population. There are, however, areas in the Bronx that have had stable, middle-class Black property-owning residents for more than 100 years. But this is generally not known.

Because of the absence of certain documented materials, oral history is becoming an increasingly important tool in the recon-

art, the writing of histories, the propounding of philosophies, is quite independent of government subsidies - and that if a point is ever reached in this country when it is not, the freedom of society, which is to say society itself, will be seriously threatened.

My experience as an applicant, a panelist and an observer of both Endowments is that, like most bureaucratic organizations, their primary interest is in power and in increasing their areas of influence and control. Those few low-echelon employees who might have some genuine interest, enthusiasm and excitement about the subject matter are gradually ground into the system, and eventually leave or bitterly abandon their advocacy roles. If we were, by some fluke, to establish the National Endowments for Bubblegum and Sinkholes, funded to the tune of 3 million dollars per annum, we would find the same serious, totally turned-off discussions going on in the halls of those venerable institutions about the virtues of elasticity and drainage.

The desire for power is clearly what brings people into government. In times of great leadership, that desire is openly acknowledged and cleverly directed to result in some public good through private satisfaction and gain. To say that such leadership has been lacking for some time now at the Endowments is to venture an Everest of understatement. While I have every hope that the new administration will endeavor to correct this, I fear that it may not move quickly or decisively enough to make the structural and procedural changes necessary to support the innovative attitudes and actions these institutions so desperately require. Without such changes, the new leaders may find themselves occupying not chairs, but the laps of marshmallow-coated tarbabies.

I referred earlier to certain differences between the Endowments and it seems relevant at this point to expand upon this. These differences are significant because they reflect certain attitudes and insecurities on the part of the American people towards the humanities and the arts, which the Endowments have exploited through distortion. At first blush, they appear to be differences not of substance but of style. In the past, for example, the NEH was likely to respond to

a sensitive FOIA request with a defensive denial. The general counsel at the NEA, by contrast, would graciously - almost enthusiastically - inform you of his willingness to comply, then vanish like a Cheshire cat, leaving behind only the memory of his smile.

It took me many months, many pages of correspondence and many hours in the halls of 15th & H and Foggy Bottom to correctly identify the differences in atmosphere, attitude and modus vivendi so equally chilling and lethal to the human soul. The NEH seemed to have been occupied by a court of eunuchs, while the NEA put forth the gaily painted, ravaged face of homosexual chic.

In its worst, most frightened and least vulnerable moments, the American public and its leaders may defensively and despairingly regard thought - the intellect - as the province of castrati (i.e., those who cannot act), and art - the emotions - as the playground of faggots. Those two national institutions which are officially empowered to guide us in these areas and to support the best expression of thought and feeling which the disciplines of the arts and the humanities can create have fed upon these distortions. As they have grown, they have sought power not by enfranchisement, but by exclusion and contempt.

Rather than energetically seeking new ways to bring the best work to the greatest number of people, they have contrived to make more and more constituencies dependant upon them for money or validation. Perhaps in this behavior they are not so very different from other government agencies, proclaiming in the interest of preserving their budgets their dedication to the public good. Perhaps their cynicism, their pomposity, their tunnel vision, their trashing of human intelligence and energy seems particularly horrifying to me because they hold sway in areas which are of professional and personal importance (areas where exactly the opposite impulses are traditionally required). If so, I can only hope that other citizens, similarly inspired by some hope of change, will come forth to criticize the institutions which have appeared invulnerable and immovable until now.

What hope do I see in the budget cuts? (On a purely personal level

I have observed that since the winds of change have started to blow, Mr. Duffey has been considerably more cordial to me upon chance encounter. Mr. Litzenberg, the surviving and perhaps sole incarnation of the NEH palace guard, however, seems to regard my presence on his turf with as much pain and disapproval as ever.) There is some possibility that when cut back to substantially lower funding levels, the Endowments may regain the flexibility, creativity and risk-taking which characterized their infant days. This would follow the assumption that their latter-day grotesqueries are the function of size, not age. Quite frankly, we have had very little experience in this country with what happens when a bureaucracy shrinks. I would like to hope for the best.

It is possible that when the Endowments - and arts and humanities institutions in general - no longer provide a means for achieving political recognition and power, people will become involved on an administrative level out of some strange delight in making them work. They will find themselves protecting not their reputations, not their organizations, but some spark of the human spirit in themselves and in the artists, scholars and communicators whom they encourage and support. Some dawning sense of the realization that it is people and not institutions which are vulnerable and precious might well begin here.

On a practical note, I would like to suggest that the Endowments curb expenses by making no full grants whatsoever. In fact, I would propose that they supply at most only one-third of the cost of any project, with the proviso that the other two-thirds be in cash, not in kind. I firmly believe that there is no idea or artistic venture so extraordinary, so wonderful and so important that only the government can be persuaded to support it. In fact, if there is no interest in any other part of society, and if the proposer himself is not prepared to risk capital to see it realized, I think its value is to be seriously questioned.

I have no specific recommendations to make about how these I would also propose the abolition of peer panels, and the costly, time-consuming double-layered reviewer and panel system of the NEH, which simply allows the staff greater latitude for manipulating the

The other thing that I would suggest is the total elimination of peer panel review and particularly the double right of review process in the matter of arts and humanities which in my experience has simply been a device for the staff to have a greater means of manipulating the decision-making process without ever taking responsibility.

decision-making process. I would propose instead having decisions made by staff and council members, where the staff will take full responsibility for their recommendations. (I.e., if enough projects which they recommend fail, are never completed, etc., their competence and judgement will be challenged and they will be subject to being replaced.) Alternatively I would suggest the use of outside reviewers, selected by a wide variety of organizations in the field, who vote by secret ballot on the proposals in a given round. Those proposals which get the highest number of votes would then be considered by the council in committee or as a whole, at meetings which would be open to the public.

Finally it should be noted that we are in the throes of a communications revolution which has the potential of making the arts and the humanities accessible to people to a degree and with a variety never before dreamed of in the history of civilization. Not incidentally, it may provide a very real means of financial support for the institutions of these disciplines as well. In the 19th Century the United States astonished Europe by turning the technology of the Industrial Revolution and the tools of mass production to the manufacture of inexpensive consumer goods. The pride in the technology which our free economy has nourished is well-founded. Technology is that which makes things cheaper - and therefore more accessible to more people. In the area of video, the tools of production as well as distribution and consumption have continued to drop in price over the past five years, in spite of inflation. I would urge the Endowments to consider this fact in directing their very limited resources. I can think of no more appropriate role for them than a pioneering effort to encourage and develop the use of the latest communications technology - and most particularly videotape, videotext and videodisc - for the distribution of the arts and the humanities and the creation of new works and formats in these fields.

Mr. YATES. Good to see you. You may proceed, Miss Motz. I think yours will be unique testimony.

Ms. Motz. Thank you.

It is not without some apprehension that I find myself testifying in support of the administration's proposed budget cuts for the National Endowment for the Humanities and the National Endowment for the Arts. I hope that by the end of my testimony the reasons for both the support and the apprehension will be made clear.

I would like to put this in some historical perspective. I long to see an end to the high-blown rhetoric in defense of these two institutions and I would like to bring to the attention of the committee that the National Endowment for the Arts was not created to support the creation of works of art but rather to support certain faltering art institutions in this country. The National Endowment for the Humanities was created because the lobbying power of the state universities and the state legislatures was able to get an honest bill through.

Whether or not those high purposes are reflected in the fact that the first chairman of the National Endowment for the Arts was a woman whose degree was in physical education and the first chairman of the National Endowment for the Humanities was a gentleman who fought so hard with scholarships that he was actively engaged in recruiting for the President's package in the intelligence community we will leave to your wisdom to ponder.

The question then arises, can an institution created in cynicism be turned to the public good. Since institutions which have been created in the interest of public good have been turned to cynicism, my feeling is, yes, they certainly can but I think the key to doing that is to keep them small and flexible. It is interesting to note that both endowments grew tremendously under the Nixon administration. Linda Garment who takes credit for this told me that the idea was to get at a rather low cost very equitable relations with the White House. My own feeling of Mr. Nixon who was an absolute genius at throwing sand at the bureaucracy somehow unconsciously figured out the way to destroy the national endowments was to flood them with money. I therefore favor the cuts because they represent some hope of a return to a real creativity and flexibility and eliminating them from being in positions of political power.

I have very specific recommendations to make about how these cuts can be effective. First of all I would suggest that no government grant be made which exceeds one-third the cost of the project. The idea that there is some ideal for some creation of work that is so precious and so wonderful and so valuable that only the Federal Government can be found to support it I find absurd. In fact, if there is such an idea, I seriously question the value of its being supported whatsoever.

The other thing that I would suggest is the total elimination of peer panel review and particularly the double right of review process in the matter of arts and humanities which in my experience has simply been a device for the staff to have a greater means of manipulating the decision-making process without ever taking responsibility.

What I propose as an alternative is that grants be made by recommendations by the staff to the council but that the staff members be responsible. In other words, if a staff member recommends 10 projects that fail, that he be liable to be fired for that. The alternative I would suggest if you want to have peer panel review is that the panels be selected——

Mr. YATES. What do you mean by fail, 10 projects that fail? What is failure in that sense?

Ms. MORZ. Well, where they either are not finished, where they do not reach the public, where they are at an agreeable level of mediocrity.

Mr. YATES. Presumably an agreeable level of mediocrity is not a standard that is used for a grant, is it?

Ms. MORZ. Well, I would say an agreeable level of excellency is not a standard which is used for a grant and that I think is one of the distressing factors. I once asked Dick Lyman about this at the National Council meeting because I was maintaining that the only purpose of the endowment was to do the best work for the greatest number of people and he said quite frankly that a very few number of grants were excellent, that the vast number were sort of medium range and some were just highly questionable. I don't think the value of flooding the world with mediocre work helps the humanities or the arts; to me that is just a disservice to both those fields.

I would suggest an alternative, if you want to maintain peer panel review, is to have the panel proposed not by the endowments but by independent organizations in the field and that these people would be willing to serve actually for no compensation. I, myself, for example, have acted as a judge at the Emmy awards. I do that as a part of my commitment to television and part of my way of paying back my activities and my success in that field.

Mr. YATES. That is interesting because I have just the opposite conclusion. I have difficulty with the system now implied by the humanities which hires outside people for so much of their reading.

Ms. MORZ. What I am suggesting is that people who are in the field, for instance that the directors go to America, that these people would propose from their membership panelists and the organizations themselves would make that request of their members and select people. These people would then be sent the proposals at home and they would vote on them with no discussion whatsoever. The proposals that receive the highest number of votes would then be discussed and the funds allotted by the council. I think it would save a great deal of money and a great deal of time and would make the decision-making process independently by the bureaucrats absolutely essential.

As a last and final suggestion I would say that is in actually the opposite direction and that we greatly regret the fact that Mr. Duffy lost out to Mr. Brademas in seeking the president's seat. He has cut back the media grants from \$11 million to, I believe, \$3 million. If the endowments are to be truly cost effective, I suggest they do what the arts and humanities have always done in the past which is use the most brilliant and the most recent technology, which in this case it would be video. In my own field the cost of a video cassette has dropped from \$17 to \$13 in the last two years in

spite of inflation. I mean if these disciplines truly want to reach the public, I can think of no more appropriate role than encouraging the most creative video tapes and video texts in terms of disseminating the arts and the humanities.

Mr. YATES. Thank you very much.

Ms. MOTZ. Thank you.

Mr. YATES. Mr. Regula.

Mr. REGULA. I have no questions.

WITNESSES

WALTER RUNDALL, PROFESSOR OF HISTORY, UNIVERSITY OF MARYLAND

MARY MEBANE, DEPARTMENT OF ENGLISH, UNIVERSITY OF WISCONSIN, MILWAUKEE

G. BENJAMIN LANTZ, PRESIDENT, MOUNT UNION COLLEGE

O. B. HARDISON, DIRECTOR, FOLGER SHAKESPEARE LIBRARY

Mr. YATES. Now we have a panel consisting of Walter Rundell, Professor of History, University of Maryland; Miss Mary Mebane, Department of English, University of Wisconsin, Milwaukee; Mr. G. Benjamin Lantz, President, Mount Union College; and Mr. O. B. Hardison, Director, Folger Shakespeare Library, an old friend.

Gentlemen and Miss Mebane, we are glad to have you with us. Your statements will be made a part of the record at this point and we will be glad to hear from you.

[The statements follow:]

United States House of Representatives
 Subcommittee on the Interior and Related Agencies
 of the House Appropriations Committee

Testimony on the Proposed Budget Reduction for the
 National Endowment for the Humanities

presented by

G. Benjamin Lantz, Jr.
 President

Mount Union College, Alliance, Ohio

March 24, 1981, 10:00 A.M.

Mr. VARTY. That is interesting because I have just the opposite conclusion. I have been talking with the people now implied by the bill by doing very many things which are implied by the bill. In the humanities which is the field of the bill, I have been talking with the people who are in the field, for instance, the directors of the American Academy of Arts and Letters, the people who would propose from their membership panels and the organizations which would make requests of their members and select people. These people would then be sent to the proposal at home and they would vote on them with no discussion whatsoever. The proposals that receive the highest number of votes would then be discussed and the funds allotted by the council. I think it is a great deal of money and a great deal of time and would make the decision-making process independent of the bureaucrats absolutely essential.

As a last and final suggestion I would say that it is actually the opposite direction and that we greatly regret the fact that Mr. Duffy lost out to Mr. Brademas in seeking the president's seat. He has cut back the media grants from \$11 million to I believe \$3 million. If the endowments are to be truly cost effective, I suggest they do what the arts and humanities have always done in the past which is use the most beautiful and the most beautiful technology in this case it would be video. In my field we have used a video camera has dropped from \$17 to \$13 in the last two years in

Mr. Chairman and Other Members of the Subcommittee:

I sincerely appreciate the opportunity to participate in these discussions leading to the distribution of a portion of our nation's resources, in this instance, to the National Endowment for the Humanities.

I believe the proposed budget reduction for the National Endowment for the Humanities is extreme and I encourage you to increase funding beyond that which is proposed in order to maintain more of the important programming opportunities in the humanities afforded by the Endowment and, more significantly, in order to continue a nationally supported emphasis on research, discussion, and the accumulation and dissemination of information relating to the broad human issues encompassed by what we have come to call the humanities, or liberal education.

I do not question the need for austere budget management. In the independent sector of higher education, specifically small liberal arts colleges such as Mount Union College, which I represent, we know the value of balancing expenditures against income. Neither am I unsympathetic with the complexity of the task with which you are faced. You must see things wholistically and deal with diverse interests and concerns in accordance with your best estimate of their significance in relation to all aspects of our society. Certainly it is apparent that as we benefit mutually from our common citizenship, so we must all be willing to suffer for the common good.

What concerns me is that the proposed disproportionate reduction in the NEH budget will cripple the efforts of our government to encourage private and local initiatives in support of programs or studies in that most basic of areas, namely, "what it means to be human" and in those issues involved in maintaining a free and humane society for those who follow after us. Some have said that,

because the humanities do not deal with sustenance or shelter, they are not a priority concern to the American people and must, therefore, assume a disproportionate share of the budgetary reductions.

Admittedly, on the surface, the humanities/liberal arts do not appear to deal directly with utilitarian activities or "how to" questions. To those whose primary focus is drawn hither and yon by the immediacy of pressing demands in areas of food, shelter, and defense, the relevance of studies and projects having to do with broad, philosophical, or historical issues may be thought to be interesting but not critical, a luxury if resources permit, but not an essential item when dollars are scarce.

I believe such a view is erroneous and short-sighted. Centuries ago, Plato contended that, "what is honored in a country will be nurtured there." When we survey our nation's history we are struck by the powerful vision which motivated and reinforced our forefathers' efforts in making the United States a nation among nations, in many respects, the envy of all. What is so striking in that vision is the fact that it was replete with wisdom reinforced by a knowledge of history, culture, religion, government, and human aspirations. The strength of our nation has been the nobility of its spirit by which our people have been inspired to build and to maintain a free society. Admittedly, there was no National Endowment for the Humanities at that time! But we live in a different time, one characterized by great complexity, radical heterogeneity, and the presence of an imminent danger from those who would employ knowledge without wisdom and those other human qualities having to do with values, responsibilities, possibilities, interdependence and compassion. The programs sponsored by the National Endowment for the Humanities have, to one degree or another, involved these human qualities. Through government support of the NEH, other private and local resources have been mustered to enable small liberal arts colleges,

universities, libraries, and other entities to engage in research, discussion, and other activities which while not being immediately utilitarian in nature, are, in the long course of human history, the stuff with which human destiny is made. On the campuses of the small colleges with which I have been associated, I have witnessed and participated in a number of programs sponsored in part by the NEH. I can testify to their value and I am deeply concerned to see such programs continued in the future.

In the Old Testament we read the story of Esau who in a moment of hunger impetuously traded his birthright for a bowl of pottage. Let us take care, lest in our haste to meet short-range budgetary constraints we jeopardize the birthright of our nation, a nation made free by truth and kept free by its persistent pursuit of that noble and humane vision bequeathed to us for our perpetuation. In focussing on broad human issues, the National Endowment for the Humanities performs an extremely important function, one which needs to be supported as generously as resources will allow.

Mary E. Malone
March 22, 1981

HOUSE SUBCOMMITTEE ON APPROPRIATIONS

For The Interior

March 24, 1981

Testimony of Dr. Mary Mebane

Lecturer in English, University of

Wisconsin, Milwaukee

There Was No Money

The year was 1955. There was ^{that} at time living in North Carolina a young black woman who supposedly was what viable, flourishing, productive societies seek to cultivate in their citizenry: she was gifted; she was hardworking; she was ambitious. Yet, after having graduated from a small black college in her hometown of Durham, N.C., she looked with despair down a long road of hopelessness. (That cum laude beside her name on the graduation program meant nothing.) There was no way that she could possibly go on to graduate school, get advanced degrees and enter higher education as a teacher for the one ingredient missing in her life, the vital ingredient, was money. And that missing ingredient would forever prevent her from realizing her dream. She tried various philanthropic organizations including the John Hay Whitney Opportunity Fellowship Fund, but to no avail. Graduate assistantships and Fellowships were unavailable to her. Then the Russians sent up Sputnik. And the Federal government responded to a need that was clearly there. Money became available, and this young black woman borrowed money under NDEA and entered the University of North Carolina as a graduate student in English. She received a Master's degree and later a Ph.D. in English. She repaid the loans that the University gave her. Now that woman has written and has published the story of her life (the first 21 years). It is Mary by Mary E. Mebane, the Viking Press, 1981.

Mary E. Mebane
March 22, 1981

Hearings of the U. S. House of Representatives Subcommittee on
Interior and Related Agencies (of the Appropriations Committee)
on the N. E. H. Budget, March 24, 1981

Testimony of Walter Rundell, Jr.
Professor of History
University of Maryland

The OMB has advocated a 50 percent reduction in the appropriations for the National Endowment for the Humanities--a reduction that would severely cripple its work. In its fifteen years of existence, the NEH has made a profound impact upon scholarship and learning, both inside and outside colleges and universities. The benefits of the NEH programs in promoting research and making the results available to the nation's citizenry have been so great that cutting the program in half would be calamitous. The NEH has done much to promote the freedom of mind that Thomas Jefferson advocated, and our government would now be ill advised to deny that Jeffersonian vision.

It's a sound idea to talk about those things an individual knows best, so I'll address my remarks initially to that aspect of the NEH that I have most acquaintance with--the Division of Research. Having sat on two rounds of panels for this Division, as well as having evaluated many proposals in this area, I think that the NEH has gotten lots of mileage from these grants. The Research Tools program of the Division has concentrated on strengthening the bases of humanistic research through grants to archives, manuscript collections, and libraries. These grants have largely aimed at enabling repositories to build collections of original sources, to process and arrange them for research, and to bring them under intellectual control through finding aids.

In this program, the NEH has recognized that the need for collecting America's documentary heritage is unending and that without quick action, sources of inestimable value will be lost forever. This activity, while benefiting humanistic researchers primarily, has also had a salutary impact on laymen. The non-professionals who have contributed their collections of letters, diaries, business records, photographs, or whatever--have likewise been sensitized to the need of preserving the documentary basis of our national experience. Thus they have become partners in the humanistic enterprise.

One of the most striking examples of such collecting funded by the NEH has been Vanishing Georgia, sponsored by the Georgia State Archives. This project strove to capture the photographic record related to the social history of Georgia. The Archives had a team that traveled throughout the state with facilities for copying photographs. The criteria for historically important photos were specific, so the program had definite aim and scope. This project has provided a valuable resource for those humanists concerned with the history and folkways of Georgians and it has given citizens a sense of their own history. That the project was funded during the early days of the Carter presidency was purely coincidental.

Another division of the NEH, Public Programs, involves laymen, as contrasted with scholars, even more directly with its grants. Agencies receiving such grants are obliged to have a program that affects the public directly. My impression is that these grants do not ordinarily involve provision for basic research, but rather the dissemination of knowledge through colloquia, lectures, conferences, publications, exhibits, and the like.

I have been impressed with the comparative paucity of funds allotted to the NEH's Division of Fellowships. To be sure, grants from this Division benefit a more discrete and homogeneous segment of the population than those from the other Divisions. In the long run, however, the NEH's support of the research of individual scholars may result in more fundamental gains for the humanities than those stemming from other programs. The research and publication of scholars, either singly or collectively, remains the foundation of all subsequent knowledge. Without it, there would be little to disseminate and popularize.

The federal government some fifteen years ago gave mighty encouragement to the training of scholars in the humanities through NDEA fellowships. Now, when many of those former fellows are coming to scholarly maturity, they find it exceedingly difficult to get the monetary support necessary for their research. If the government were to aspire to any consistency of policy--surely an unorthodox if not heretical notion--it should provide resources for the continuing intellectual development and contribution of those it helped train in the humanities. In addition to former NDEA fellows, other academic humanists sorely need research support, and our society greatly needs the contribution they alone can make. An additional fraction of the NEH's grant budget would enable a significantly larger number of scholars in the humanities to pursue their research that will lead to the total increase of human knowledge and understanding. Academic humanists would benefit greatly from this slight reallocation of funds within the NEH, and I think our nation would ultimately be the gainer.

In the Department of History at the University of Maryland, scholars have benefited directly from NEH Fellowships, and the results of their research are adding significantly to the understanding of our nation's history. The Papers of Booker T. Washington, edited by Louis R. Harlan and Raymond M. Smock, now near completion. These dozen volumes illuminate the career and times of a highly influential leader of black Americans at the turn of the century. Whitman Ridgway's book on Maryland political elites in the Jacksonian period aids our understanding of how state governments functioned before the Civil War. Wayne S. Cole's forthcoming study of FDR and the isolationists benefited from a research fellowship. These three projects illustrate the ways that NEH grants have aided scholars in explaining important aspects of the American experience. Such instances could be cited for virtually every state in the union. My own research on the Texas oil industry has centered on the archives, museums, and libraries that have preserved the documents pertaining to this vital subject. Many such agencies have received important support from NEH grants.

Another way that NEH grants have benefited scholarship has been through publication subventions to university presses. For years foundations made research grants, but provided no means for the publication of their results. In the early 1970's the NEH wisely incorporated subventions in its granting programs. Those outside universities might question the need for publication subsidies, thinking that anything worthwhile would surely get published on its own merits. This is decidedly not the case with

scholarship. Many manuscripts have too narrow a focus to guarantee popular appeal, yet their importance cannot be measured by market-ability. Sir Isaac Newton's Principia sold only a few hundred copies during the first century of its existence, yet it remained the cornerstone of mathematical understanding until Einstein modified it with his theory of relativity, which also had limited sales when published.

The strength of our nation must not be interpreted in military terms alone. No rational citizen denies the need for an adequate defense, but in a democratic society, strength must also be expressed in terms of the mind and spirit, as developed through the humanities and arts. It would be exceedingly shortsighted for our national policymakers to forsake their responsibilities to the humanities now. To do so would move us toward a garrison state, thus narrowing the differences that separate America from those societies that would enslave the minds of men.

House Subcommittee on Appropriations for the Interior

March 24, 1981

Testimony of Dr. O. B. Hardison, Jr., Director
Folger Shakespeare Library

representing the Independent Research Libraries Association

Mr. Chairman and members of the Committee:

I am testifying today on behalf of the Independent Research Libraries Association, a national organization of fifteen independent research libraries. These libraries are independent in the sense that they are privately rather than publicly supported and receive most of their income from endowment, private donations, grants, and income from photoduplication and admissions to special events. Their central services — access to their collections and reference and catalogue assistance — are offered free of charge to all qualified readers. Among the libraries for which I am speaking are the Huntington Library in San Marino, California, the Newberry Library in Chicago, the American Antiquarian Society in Worcester, Massachusetts, the Research Division of the New York Public Library, the Pierpoint Morgan Library in New York, and my own library, the Folger Shakespeare Library in Washington, D. C.

Collectively, the Independent Research Libraries house over 13 million volumes and 45 million manuscripts ranging in date from

antiquity to the modern period. Individually, many of them house collections focused on specific periods of history that are unique in scope and are therefore irreplaceable parts of America's cultural heritage. The American Antiquarian Society in Massachusetts, for example, holds the largest collection of American colonial printed materials in the world, while the Folger Library is preeminent in its Shakespeare holdings, is the finest collection in North America of books and manuscripts of the English renaissance period, and has Continental renaissance holdings of world stature.

The Independent Research Libraries serve as custodians of the intellectual and spiritual heritage that America derives from its past. Because of their collections and specialized services they are also centers for advanced study in the humanities. The Folger Library, for example, sponsors an Institute of Renaissance and Eighteenth Century Studies which is supported cooperatively by eighteen universities ranging from Princeton in the north to the University of South Carolina in the south. The Institute is one of the largest cooperative programs in the humanities in the United States, if not the largest. It provides seminars for teachers and advanced students which would be too expensive for the participating universities to offer individually and which draw both strength and focus from the Folger's collections.

The research libraries for which I am speaking have two fundamental responsibilities: they must preserve their materials so that they can be transmitted undamaged to future generations, and they must make their materials available to readers. Meeting these responsibilities has always been expensive. It has become far more so in the last ten years.

This brings me to the National Endowment for the Humanities. From its inception in 1965, but particularly since 1970, the Endowment has played a central role in maintaining the ability of the Independent Research Libraries to meet their responsibilities. It has assisted them directly through grants for conservation, cataloging, fellowships and seminars, and it has assisted them both directly and indirectly through its challenge grants. Challenge grants are awarded on the condition that they be matched three-for-one by private dollars. In the case of the independent libraries, the challenge grants have typically generated far more than the three-for-one match envisioned in the program's guidelines. By dramatizing the needs of the independent libraries, the challenge grants have galvanized the energies of trustees and have greatly increased average levels of support from donors, corporations and foundations. It is fair to say that they have been the decisive factor in reversing a widespread decline in the fortunes of the independent libraries and have given many of them an opportunity for genuine renewal.

Let me illustrate my points by citing the example of the Folger Library. Like most of its sister institutions the Folger was created for public benefit by an act of private philanthropy. It was established in 1930 through the will of Henry Clay Folger, the first President of the Standard Oil Company of New York. Mr. Folger placed it on Capitol Hill because he felt that the location was the symbolic center of the United States, and he wanted his library to be, in his words, a gift "to all the American people." He designated the trustees of Amherst College, his alma mater, its administrators.

When I came to the Folger in 1969 I found a building which — though one of the showcase buildings on Capitol Hill — needed extensive exterior renovation and a massive upgrading of its fire prevention, security and climate control systems. The building was in real danger of becoming not an asset to Capitol Hill but a shabby, delapidated liability; and because of its antiquated internal systems, its collections were visibly suffering. The ideal temperature for rare materials is 65 degrees fahrenheit, and the ideal humidity is 50 percent. When temperature and humidity vary widely and frequently from these norms, bindings warp, mold grows on organic materials, and paper deteriorates, becoming so brittle eventually that it crumbles when handled. In 1969 and 1970 we were recording fluctuations in rare book areas of the Folger of from 65 to 90 degrees fahrenheit and of from 20 to 85 percent relative humidity.

Today if you walk three blocks east of the Capitol on East Capitol Street you will see the results of ten years of hard work to rectify the problems I have listed. The building has been restored to its original beauty and integrity. A second reading room is under construction on its south side to accommodate the readers who come from all over the United States and from abroad to use the collection. Most important — though invisible from the exterior — the Folger has a superb climate control system and equally fine security and fire prevention systems. It is once again an architectural asset to Capitol Hill, and its collections are as well protected as modern conservation technology can make them. The Folger has obviously gained in this. I believe the American people have gained as well.

My reason for summarizing this history is that the Folger could not have achieved its goals without a challenge grant from the National Endowment for the Humanities of \$750,000, awarded at the beginning of its fund-raising campaign in 1977. This challenge grant had a truly remarkable catalytic effect on trustees, foundations and other donors. We were given three years to meet the grant's matching provisions. We completed the match in eighteen months. Since completing it, we have continued to raise money for the project, and thus far we have raised \$6.2 million of the total project cost of \$8.0 million. The initial challenge grant of \$750,000 thus provided the stimulus for more than

\$5.5 million in private funds. This is not a three-for-one ratio but a seven-to-one ratio. I stress again that the challenge grant was crucial to our success. Without it the job of locating the necessary support would have been impossible. The library building would still be decaying, and the collection would still be slowly but inexorably deteriorating.

The challenge grant program is only one of many programs of the National Endowment for the Humanities that are important for the Independent Research Libraries, but it is a vital one. It helps the libraries protect and conserve their unique materials, and it is clearly a powerful incentive to private giving. If the proposed fifty percent cut in NEH appropriations is carried out, however, the challenge grant program will be terminated. In addition, several other programs that benefit the independent libraries — including a small pilot program in conservation — will either vanish or will be cut so severely that their effectiveness will be impaired.

The Independent Research Libraries depend heavily on endowment income. They have been hurt badly by the inflation of the last decade. For this reason they understand fully the urgency of the need to control the federal budget. They believe, however, that a cut of fifty percent in the budget of the National Endowment for the Humanities is both disproportionate to the reductions proposed for other federal agencies and destructive of the

legitimate objectives of the Endowment. They believe further that the elimination of the challenge grant program would have consequences which are contrary to the national interest. Since this step would eliminate what is presently one of their most effective means of attracting private support, the adverse consequences would be multiplied. The ability of the libraries to protect their priceless and unique materials would be impaired, and their ability to accommodate readers and to serve as centers for advanced study would be in jeopardy. As I have already noted, protection and conservation are the most basic of the responsibilities of the independent libraries. If these responsibilities are not met the American people will be the losers along with the libraries.

In sum, we believe that the National Endowment for the Humanities is performing a vital service which is in the interest of the public as well as the direct beneficiaries of its grants. The cost of the Endowment at full funding is minute in comparison with the overall federal budget. If a reduction in the Endowment budget is necessary, it should be reasoned and temperate. We respectfully hope that the Committee will share our view.

Mr. LANTZ. Thank you, Congressman.

I should indicate we are not speaking in the order we appear in the schedule. I am Benjamin Lantz, President of Mount Union College and will be speaking on a more general basis than my colleagues; they in turn will speak and will be introduced each in succession.

I appreciate the opportunity to be here and wanted to mention to Congressman AuCoin that I was one of those people representing those small institutions of which he spoke so well this morning and so astutely, I thought. It is not an unknown institution, however, and does have its representatives here and there and everywhere and no more illustrative one than sitting to your right, Congressman Regula, who is both a graduate of Mount Union College and I should indicate as trustee of the college one of my bosses.

Mr. YATES. We won't hold that against him.

Mr. LANTZ. I do count it a distinct privilege to be able to participate in this phase of distributing our nation's resources, or at least a portion thereof, and particularly that which is not going to go to the National Endowment for the Humanities.

I want to emphasize at the very beginning that I come not without appreciation for budget austerity. As a representative of a private college, a small college, I am quite well aware of the fact that one must balance expenditures against income and being under no illusion regarding that I am in the next instance appreciative of the difficulty of your task; namely, deciding what will be cut and what will not be cut. In this instance I respectfully register a strong concern and in fact a disagreement with the budget cut that is being proposed for the National Endowments of the Humanities which I believe is disproportionate and in the long run will be detrimental to the life of our nation as well as specifically to higher education of which I am a part.

I guess one of the things that concerns me as much as anything else is the fact that it represents a statement against what in the private liberal arts college setting we believe to be at the very heart of not only the educational enterprise but the enterprise of living in society; namely, learning what it means to be human. One of our poets sometime ago had one of his characters say that the reason he was pursuing his destiny was in order to learn how to be human, and it seems to me that the cuts that are being proposed are in the specific area of learning what it means to be human and learning how to maintain and create and enhance a humane society for those who follow us.

Quite frankly, I doubt that there is a stronger reason for being here than that the statement has been made that because the humanities do not deal with sustenance or shelter they are not a priority concern to the American people and must therefore assume a disproportionate share of the budgetary reductions. Without attempting to be eloquent, if that statement is true, God help us all; they are at the heart of what it means to live and they are at the heart of what we are as a nation.

Now I am well aware of the fact that to those whose primary focus is drawn hither and yon by the immediacy of pressing demands in the areas of food, shelter and defense, the relevance of studies and projects having to do with broad, philosophical, histori-

cal issues may be thought to be interesting but not critical. A luxury, if resources permit, would not be an essential item when dollars are scarce. I believe that such a view is categorically erroneous, shortsighted, detrimental and dangerous.

Centuries ago Plato contended that "what is honored in a country will be nurtured there." The converse may well be true, what is nurtured in the country will in time be honored there and if we had a lack of honor for the humanities, we must be about the task of nurturing them even more.

When we survey our nation's history we are struck by the fact that a small nation, a relatively defenseless nation, a struggling nation, maintained and surprised the world with a strength that no one had expected. That strength, I suggest to you, was firmly fixed in the strongest element of defense we have ever had or any other nation has ever had, a strong commitment to a well defined system of values and an underlying philosophy.

The strength of our nation has been the nobility of its spirit represented in our forefathers. As we look at our forefathers and the vision they had, there is very present the fact that it was replete with wisdom reinforced by a knowledge of history, culture, religion, government and human aspirations. Now admittedly there was no National Endowment for the Humanities at that time, but we live in a different time, one characterized by great flux, radical heterogeneity and the presence of an imminent danger—an imminent danger from those who would employ knowledge without wisdom and without those other human qualities having to do with values, responsibilities, possibilities, interdependence and compassion.

I trust that we are not so far removed from the Second World War as to be reminded of what can happen when people are well versed from many aspects of knowledge but have not the underlying permeating value system to use that knowledge in a human fashion to human good and not to human detriment. It is my personal opinion that the program sponsored by the National Endowments for the Humanities have to one degree or another involved precisely these human qualities and aspirations.

Through government support of the NEH, other private and local resources have been mustered to enable small liberal arts colleges, universities, libraries and other entities to engage in research, discussion and dissemination, collection of information having to do with the broad issues facing human kind. On the campuses of the small colleges with which I have been associated, three in number, I have witnessed and participated in a number of programs sponsored in part by the NEH and have served as the chairman of the Division of Humanities in one of those institutions. I can testify to their value and I am deeply concerned to see such programs continued in the future. As a matter of fact, I would say without hesitation that the most stimulating intellectual experience I have ever had was at West Virginia Wesleyan in a program in the humanities sponsored in part by the National Endowment which simply would not have happened had it not been for the underwriting of the National Endowment.

In conclusion may I remind us of an old story. In the Old Testament we read the story of Esau who in a moment of hunger

impetuously traded his birthright for a bowl of pottage. Let us take care, lest in our haste to meet short-range budgetary constraints we jeopardize the birthright of our nation, a nation made free by truth and kept free by its persistent pursuit of that noble and humane vision bequeathed to us for our perpetuation. In focusing on broad human issues, the National Endowment for the Humanities performs an extremely important function, one which needs to be supported as generously as resources will allow; one which needs to be seen as a high priority, not a low priority, for the future of our Nation.

Thank you very much. Mary Mebane, Department of English, University of Wisconsin, Milwaukee.

Mr. YATES. Well, before Miss Mebane starts I just want to say that I was most impressed by your statement and I hope that its message is one that your college is giving its students and that they come away having graduated with that same message.

Mr. LANTZ. To the degree that we are able, we try, and to the degree that Representative Regula is reflective of that broad humane concern we think we have succeeded.

Mr. YATES. All right.

Mr. REGULA. Mr. Chairman.

Mr. YATES. Did you want the floor, Mr. Regula?

Mr. REGULA. I would have to be counted as a failure because at the time I graduated we didn't have this program.

Mr. YATES. Well, I know, but you are still with the college and you are instilling the humane spirit, aren't you?

Mr. LANTZ. We may have succeeded in spite of not having it.

Mr. REGULA. You may or may not agree with the success of what they did at a later time.

Mr. YATES. I would say that my experience with all the graduates I know from your college indicates that the message has been absorbed and has taken root.

Thank you very much.

Mr. LANTZ. Thank you.

Mr. YATES. Ms. Mebane.

Ms. MEBANE. My name is Mary E. Mebane and today I am going to give a purely personal statement.

Mr. YATES. Would you permit me to interrupt. I am going to have to turn this meeting over to Mr. Regula and I will be back.

Mr. REGULA. You may proceed.

Ms. MEBANE. The main point of my presentation will be the outcome of the importance of the Federal Government assisting citizens who don't have another avenue. First I will give you a little personal history.

I was born in Durham, North Carolina in 1933 and the date of my birth is very important because I am a member of the last generation raised on the legal segregation in the South so I know personally what that means, and it means the total lack of opportunity. When I grew up as a teenager I had several options as to my life's work. I could work in the tobacco factories in Durham and I guess the best known at that time was Liggett & Myers, the makers of L&M and Chesterfield and BelAir, and American Tobacco, the makers of Lucky Strike. There were several smaller fac-

tories. Most people looked forward to working in the factories, they had a steady job and the pay was better.

Another option was Duke Hospital which employed a lot of blacks in the housekeeping department and diabetics. The third option would be domestic work or something similar.

I was an American citizen, by the way, and I was gifted. I was very hard working and I was very ambitious but we had a society that excluded me and literally tens of thousands of other people from it. In spite of that I did go to college, mainly because there was one in the town, and I commuted every day for four years. It was a small black college that is still there in Durham.

However, when I graduated, I graduated at the top of my class, summa cum laude, the only one. I had no way of going on to graduate school. I could get no assistanceship, I could get no fellowship aid and I wanted very much to get out of the segregated setting for graduate school but I could not. That situation existed for five years from 1955 when I graduated until 1960.

By 1960 the Russians had launched Sputnik and the Federal Government became interested in various aspects of education and money became available to an ordinary person like me without other resources and I borrowed money from the University of North Carolina at Chapel Hill and in February 1960 I entered graduate school there. Eventually I did get a master's degree in English and in the early Seventies I got a doctorate in English from the University of North Carolina largely with Government loans although I did get some private fellowship money in the later stages of my academic studies.

I went on to enter higher education on the college level as a teacher of English. Eventually I started writing and I am very happy to say I have just published my life story which is called *Mary* and it has received very high critical acclaim. So far it is not a best seller but we are still hoping.

So the fact that I did realize some of my dreams and did become a productive citizen of this country, both those directly relate to the fact that the Federal Government made available money to citizens everywhere so it did not matter what your parents did for a living or even whether you had parents or what social status or what class you belonged to or any other extraneous things; that if you had talent then you had demonstrated that you were a capable person and would produce, that you had an option that had never been available before in American life. So I think that the committee should keep this in mind when severe cuts are being discussed in the humanities and arts. That is not just an abstract statement but these programs affect the lives of many people.

I think, too, without seeming to do some special pleading that you should think about the fact that in the last 15 years in American life the submerged ethnics have suddenly come to life and I think they have tremendous energy. I am one of the submerged ethnics but there are many such groups that have become extremely local in the past 15 years and have started entering American life with tremendous energy and tremendous potential. I think that the Federal Government still has more interest in them than perhaps any city or state government would have and I think it would lead to the value of the country that every citizen be not only

allowed to but encouraged to develop whatever potential they have. I think that is one of the meanings of the humanities.

That is my statement.

Mr. REGULA. Thank you.

Mr. RUNDELL. The benefits of the NEH programs in promoting research and making the results available to the Nation's citizenry have been so great that cutting the program in half would be calamitous. The NEH has done much to promote the freedom of the mind that Thomas Jefferson spoke of so eloquently and I think our Government would now be ill-advised to deny that Jeffersonian vision.

There are several areas of the NEH program that I would like to speak on just briefly to illustrate these points. The Division of Research has done much to promote the creation and preservation of archives, of manuscript collection, of libraries, the very basis for any sort of learning, any sort of scholarship in the humanities. We think so often our citizens who are not scholars take this sort of thing for granted but if there is to be future scholarship, then we must have the original sources and the Division of Resources has insured through its programs the preservation of some highly important things.

Just one illustration in particular. The state archives of Georgia proposed a project called Vanishing Georgia that it had started itself and then it came to NEH for money. This was a photographic archives that it was collecting according to very specific criteria of the sorts of things that would qualify. A grant did come through and as a result of this Georgia has been able for the period of about 1880 through 1920 to have a very systematic photographic record of the experience of the people. This was not a political archive at all, not famous people but the people.

Mr. REGULA. Is this 100 percent grant or was it matched?

Mr. RUNDELL. No, it was matched. As I say, it was started by the Georgia State Government and then the NEH came in with a supplemental grant. The fact that this got started during the early years of the Carter administration is purely coincidental.

There is the Division of Public Programs which is not related specifically to scholars, it promotes colloquia, lectures, exhibits, things like this. It really enables the citizens of the Nation to understand something of what humanistic scholarship means in their lives.

Then there is the Division of Fellowships that has done a great deal in promoting the work of individual scholars as well as groups of scholars. I am a professor of history at the University of Maryland and I don't have any direct benefit from any of these fellowships but I would like to say something about three projects in our department there.

The department is responsible for the papers of Booker T. Washington being edited by Professor Louis Harlan and Dr. Raymond Smock. This is a 12 volume project that will make available to interested citizens the information about Washington's life who was really pre-eminent in the black world from the turn of the century or the famous Atlanta address of 1895 and then through the period of his death from 1915 he was a very important spokes-

man, and at the University of Massachusetts his nemesis duBois is having his papers edited there.

One of my colleagues, Whitman Ridgway, has published a book on political leadership in Maryland from 1790 to 1840. He was the recipient of an NEH grant. Wayne Cole's forthcoming study of FDR and the isolationists benefited from a research fellowship. My recent work which has been centered on the history of the petroleum industry in Texas has relied on the kinds of institutions that have received support institutional grants to build artful collections—such places as the University of Texas archives, the Plaines Historical Museum, the Humanities Research Center at the University of Texas, the Institute of Texan Cultures in San Antonio, the South Collection in Texas Tech and the Permian Basin Petroleum Museum in Midland.

One of the really enlightened programs of the Humanities Foundation has been the program to give university presses extensions to publish the results of scholarship. For years and years a scholarship would be endowed or would be supported by research grants and scholars would often have difficulty getting their material published. The program which was begun by Matthew Hudson, Director of the University of North Carolina press, has enabled the publication of any number of projects. For instance, anything that is supported by an NEH grant will have on the frontispiece a statement of fact that this publication was supported in part by a grant from the NEH, and this is a very important thing.

Now citizens who are not involved in scholarship might say, well, anything worthwhile is going to get published. This is not necessarily so, particularly in view of what someone referred to this morning very correctly as the very capricious publication. Many good things of a specialized nature today could go wanting. I think it is worth noting that Sir Isaac Newton's Principia sold less than a hundred copies in the first century of its existence and yet it remained the cornerstone of mathematical understanding until Einstein's theory of relativity came about and when that was published it also had a rather limited market. I think there is a very definite place for Government help for this sort of thing.

I think that the strength of our Nation must not be interpreted in military terms alone. No rational citizen denies the need for an adequate defense, but in a democratic society strength must also be expressed in terms of the mind and spirit, as developed through the humanities and the arts. It would be exceedingly shortsighted of our national policy makers to foresake their responsibility to the humanities now. To do so would move us, I am afraid, toward the garrison state, thus narrowing the differences that separate Americans from the societies that would enslave the minds of men.

Thank you.

Mr. REGULA. Thank you, Dr. Rundell.

Our last witness on the panel is Mr. Hardison.

Mr. HARDISON. I am Director of the Folger Shakespeare Library in Washington and I am appearing here on behalf of 15 independent research libraries, including the Folger Library; the American Antiquarian Society in Worcester, Massachusetts; the Hunting Library in San Marino, California; the Research Division of the New York Public Library; the Pierpoint Morgan Library in New York

and others. They are a very important group of libraries, they are custodians of a very significant part of America's spiritual heritage.

I don't think I can add a great deal to the general points made by my colleagues, I agree with them completely. You have my statement in its written form. What I would like to do now is to turn from general points to very specific things and offer a couple of exhibits. I offer here Exhibit 1 which is a book from the Folger collection. It has a signature of Washington Irving in it and it was a gift of Washington Irving to his nephew Pierre. You can see what has happened to it. If you think of this as a tiny piece of America's spiritual heritage, you can see the problems under which the independent research libraries are operating.

Let me remove the cover here. Here is a piece of paper from this book on which I have written American Heritage and as you will see what happens when you subject this paper to just a little bit of stress you can see that our American heritage is in danger of quite literally disappearing.

Now there is nothing you can do to prevent this heritage from disappearing over periods of thousands of years but you can record the loss of this heritage and that is one of the principal functions of the independent research libraries. If you would like, I think I have an extra sheet of paper here and I would be glad to submit that in evidence if anybody on the committee would like to try the experiment.

Now my Exhibit 2 I didn't bring with me because it is a little bit too large to bring with me, it is the Folger Shakespeare Library, but it is only four blocks from here opposite the Supreme Court of the United States. When I came to Washington in 1969 I found a building which was given to the American people in his own words by Henry Clay Folger, placed on Capitol Hill because he felt it was the symbolic center of the United States and would be visited by people from all over the country and be available to them and which when it was created was one of the showcase buildings of Capitol Hill, a very lovely building. In 1969 it had deteriorated very seriously and it was in danger of being not a showcase of Capitol Hill but a delapidated liability and ultimately perhaps a picturesque ruin.

What was true of the exterior of the building was much more true of the interior of the building. Rare books and manuscripts like a temperature of 68 degrees Fahrenheit and a relative humidity of 50 percent. We were recording temperature fluctuations of between 65 and 90 degrees and humidity fluctuations of between 20 and 90 percent in the rare book areas of the library because the electrical and mechanical systems were those of 1932 and they were totally inadequate to current standards of preservation.

I felt that we were in a desperate situation. I put a lot of work into this, the staff put a lot of work into it and by 1977 we knew what we had to do and we knew more or less how expensive it would be. We had tried very hard to galvanize our trustees and supporters but some central factor was missing and it was in that year that we received a challenge grant of \$750,000 from the National Endowment for the Humanities.

The effects of this grant exceeded my expectations very substantially, I found them remarkable. They galvanized our trustees, they created a much higher degree of sensitivity to our problems among foundations and other granting agencies. Since 1977 on the basis of that \$750,000 challenge grant we have raised an additional \$5.2 million toward renovation. That is not a 3 for 1 ratio, that is more like a 7 to 1 ratio. Our total project cost will be about \$8 million. We still have \$1.8 million to go but we are well along the way. Much more important, if you walk past the Folger today you will see a building whose exterior has been fully restored which is now an asset to Capitol Hill and will be one in the future and if you go into the building you will find the best climate control, fire prevention and security systems that modern technology can provide. I think the Folger Library has gained enormously because of the challenge grant of the National Endowment but I am persuaded that the American people have gained, too.

I speak for all of the independent research libraries in saying we think that for us the work of the National Endowment has been absolutely crucial. Most of us have undergone something of a renewal in the last 10 years after decades of relative decline and I would place the responsibility for that as much in the National Endowment as anywhere. The amount of money contributed by the taxpayer to this has been miniscule in comparison to the amount of private money that has been attracted to these libraries through the challenge grant program and certain other programs of the Endowment.

I speak for all 15 of these libraries in saying that we feel that the proposed cuts in the Endowment budget are disproportionate. We believe that these cuts reflect not so much a desire for economy as hostility to the basic goals of the National Endowment though we are hard put to decide why anybody should be opposed to these goals and we feel that if the endowment budget is cut and the challenge grant program is discontinued as has been publicly announced, what happens if the endowment budgets are cut by 50 percent. We feel that a great deal more of the American heritage is going to disappear and it will disappear much more rapidly than it otherwise would do.

Thank you.

Mr. REGULA. Thank you, Mr. Hardison.

I am intrigued. Are you really suggesting that those people who contribute privately would not be motivated to do so without the 1 to 7 grant from the endowment? Is that correct?

Mr. HARDISON. The conditions of the grant are that it be matched 1 to 3. What I am saying is that astonishingly the result is not 1 to 3, in our case it is 1 to 7 and I think other libraries have had better experience.

Mr. REGULA. Are you suggesting that without that initial challenge you would have great difficulty getting that private funding?

Mr. HARDISON. I can say until we got that challenge grant we were getting nowhere. I think that challenge grant created what Samuel Taylor Colridge called that willing suspension of disbelief that constitutes poetic faith. It did. I think not only the American people but I think Washington has gained in the process because

that building is a showcase here on Capitol Hill and it would have been a problem if it had not been restored.

Mr. REGULA. I just came here from a hearing on military construction appropriations and the challenge I present to each of the people testifying is, now you are here suggesting what your needs are. What are you suggesting by way of making your activities in constructing military facilities more efficient?

I would like each of you to comment in terms of the endowments whether you think there are any positive steps that we could take to insure that this money that is put into the endowment is more effectively utilized for the benefit of all the American people and I would like to have each of you comment on that.

Mr. HARDISON. Would you like me to start?

Mr. REGULA. Fine.

Mr. HARDISON. I feel that any agency that makes grants is going to have an imperfect record and to demand a perfect record is a little bit like demanding an end to original sin. I think the endowments procedures as far as I am privy to them are responsible and objective.

Mr. REGULA. You don't agree with the prior witness?

Mr. HARDISON. I am in favor of the peer review process simply because I don't know of any other process which is any better than that. When somebody says democracy is the best form of government because there is no government which can improve upon it; all more efficient efforts of government result in enormous problems and I think probably this could be—if any year you can examine the results of the peer review process, then you can secondguess the peer review committees. I think, however, if you had other systems of making grants you would find far greater problems emerging.

Mr. REGULA. You don't agree with the criticism that is often voiced that tends to be a little bit in-house in that the peer review becomes a matter of you take care of my project today and I will take care of yours tomorrow?

Mr. HARDISON. I think that is probably a built-in hazard and I think the endowment should, and I expect that it does, make efforts to change the membership on the peer review committees frequently enough so that you don't have any entrenched group that can control the direction of the grants.

Mr. REGULA. Dr. Lantz.

Mr. LANTZ. Again as a representative of a small college I would have to acknowledge that there is frequently a feeling, if not an informed opinion, that there is something of a sharing of the pie on the basis of who is known and who is not known in colleges and universities across the country, not so much so perhaps in the National Endowment for the Humanities and the Arts as perhaps in the HNE, some of the experience we have experienced there. Some very, very fine programs have not been funded in colleges not having the prestigious names, not having the prestigious publications of some of our sister institutions.

I think some of this could be taken care of by a more careful examination of the degree to which there is a diffusion of the funds throughout the country and throughout the institution and as a justification for that if in truth the argument can be made that

there are not enough good programs coming out of some of those areas, then that in itself merits the consideration and concern on the part of the endowments to see that something is happening there which is not so some attention could be given to making certain that there is a geographical distribution of programs however originated and initiated to insure that the American people generally are benefited by the expenditures of tax moneys in these situations.

Mr. REGULA. How many dollars have moved to Mount Union College since the inception of this program and perhaps sister institutions that you are aware of?

Mr. LANTZ. Mount Union College specifically, and I say this with a matter of some pride, we have not applied for grants since I have arrived there in six years and the reason is because I have not felt that the faculty or the overall constituency of the college was ready to utilize the grants with merit and with good stewardship and I see no reason to apply for something we don't need. We have been able to benefit from what others have done; as a matter of fact, right now we are engaged in a general study of our curriculum. Many of the resources we are using are the direct products of what other people have done under the auspices of programs partially sponsored by the NEH. We have benefited through faculty, fellowships and stipends.

Mr. REGULA. These were grants directly to the faculty?

Mr. LANTZ. Directly to the faculty members having an equally direct benefit to the institution, to the students and to the community. Worcester has had a humanities grant, the dollars involved I am not certain; in northeast Ohio and that area Hiram has as well. Again I participated in a number of them at Ohio Wesleyan and at West Virginia Wesleyan and amounting in those instances to multihundreds of thousands of dollars and at West Virginia Wesleyan about \$350,000 or thereabouts. That is over a period of time, that is not in one grant. So whereas the amount of money coming in is not always a large amount to a specific institutional impact, it is slightly broader in its scenario.

Mr. REGULA. Suppose that the endowment were constructed in the form of block grants to the States, would you have confidence that the States would have the ability to administer these perhaps on a broader base, an impact closer to the communities and the institutions involved?

Mr. LANTZ. I would see some of the same possibilities or problems. However, the determinative criterion would be the way it is set up, the way it is monitored. I still like the peer review and you would need peer review at that point, too, because people in the field have a general sense of what is working and what is worthwhile because of their experience. Something of a geographical distribution might be better than what we have now.

Mr. REGULA. Ms. Mebane, I gather that you were directing your testimony to the education programs in terms of providing access.

Ms. MEBANE. That is the principle I was trying to speak to.

Mr. REGULA. What about with regard to the Federal Government?

Ms. MEBANE. The Federal Government has an obligation to each citizen and certainly in the State where I was born and in the

region where I was born the States didn't care, there were certain people that they were interested in and then others just had to do the best they could and I think this is very, very unfair on the part of the entire American system. I think America is more democratic today than it ever was and I certainly feel that the government's concern for each citizen is a part of that current democracy. So when it comes back to States rights I am very hostile to that because I was raised on the States rights and it was extremely unfair.

Mr. REGULA. I notice you are in the Department of English at the University of Wisconsin. Has your institution had programs sponsored by the Endowment for the Humanities that you are aware of?

Ms. MEBANE. Yes. I always have to talk on a very small scale because I am not in administration and I have not been there that long. Except for the 20th Century States which is on the ninth floor of the building that I am in it has a very vigorous series of lectures all the time and they sponsor poetry readings, for example. I read myself two weeks ago at UWM studio and they are now having a lecture speaker on the reindustrialization of America.

Mr. REGULA. These are sponsored by the endowments?

Ms. MEBANE. Yes. It says at the bottom of all the posters The National Endowment for the Humanities. In this very small area on the college division level in science I see constantly the things that are of value to the entire university community plus the citizens. The university reaches out to the city all the time that the funds are going to enrich the citizenry and I think that is the primary focus for being eventually a citizen rather than in a particular profession.

Mr. REGULA. Thank you.

Dr. Rundell, let me play the devil's advocate here for a minute. In your statement you said something to the effect that the absence of this program would move to a garrison state. I think those were your words. My question would be that for about 196 years in the absence of the endowment we moved away from that very thing. We achieved these goals as a society that are highly desirable without the endowment and I question whether in fact the absence of it would go in the other direction to the extent that you are indicating.

Mr. RUNDELL. Yes. What I was referring to there was we see the current administration's emphasis on the military budget at the expense of such things as the NEH and it would seem to me that this would be an emphasis toward the garrison state at the expense of the kinds of programs that the NEH and the NEA have sponsored. I also said, you recall, that no rational system questions a need for a strong defense but there seems to be something askew here.

Just recently I saw that part of the increased appropriations for the Department of Defense was a \$52 million item for military bands. Well, I wonder if martial music is really that important.

Mr. REGULA. Let me say we can have some horror stories in the Endowments for the Humanities if we want to get into that.

Mr. RUNDELL. I don't doubt that at all.

Mr. REGULA. So all functions of Government should be challenged as I have done on the military construction side. I am simply challenging all of you to say what are your suggestions for a better way, if any, and are there any criticisms that you might have of how this distribution system works. I have plenty in the military and have voiced them and I might say we have got a \$3 billion extra amount of money in military construction and a good chunk is for family housing. We are talking about the quality of life of these people which is not a garrison state issue but you are fairly close to Washington. Do you think that the distribution system or the way in which this money is designed to enhance the quality of civilization in the United States could be better accomplished than it has been?

Mr. RUNDELL. Yes, I do. I have said elsewhere that as a result of some acquaintance with the program that there may be a disproportionate amount spent on a certain part of the NEH budget. For instance, I think that some of the public programs are not as likely to have the kind of payoff in the humanities as some of the others. I am particularly impressed with the building of research facilities through the programs for archives management and collection libraries. Also, I think the fellowship program is likely to produce as many results for the citizenry as possible simply because of the free marketplace of ideas being what I think is a real cornerstone of our democratic society and some of these others I think have been too PR oriented trying to get to the people the message of endowment that all citizens have something to gain from the humanities endowment.

Now I am sure there are others that would disagree but you asked for my own reaction and I think that there should be more flexibility in the budget so that if you have a state of highly worded program, say, in the division of research or the division of fellowships with others in comparison with less appropriate programs in division X, then they should be able to shift that so that you are funding programs of marginal merit. Of course divisions are very unwilling to give up any part of their budget if they don't use it all.

Mr. REGULA. You are touching something that Dr. Lantz mentioned that Mount Union has not received any apparently because they have not developed an application. Do you think there is an element of grantsmanship involved here whereby perhaps larger institutions have the ability to have the staff people out there seeking these dollars? I notice it happens in the cities. Little towns in my community get very little. The big cities get the lion's share because they practice the art of grantsmanship and the larger the city the more people they can assign to getting money out of our government. Now do you think that is a problem as evidenced by the inability of Mount Union to get a share? You are coming from a large school as a contrast.

Mr. RUNDELL. Yes, I think there is some problem there. Small institutions, small libraries may not be able to have the kind of preparation of the program although recently I did sit on a panel—this was a year ago—and the public library in Jim Thorpe, Pennsylvania did get a grant to upgrade its program. In any situation like this there are going to be some inequities but I think that I

would re-emphasize overall that the kind of research and learning both in the academy and in the population at large that are supported by this NEH is a very important aspect of our democratic society.

Mr. REGULA. I would ask all of you or any of you that choose to comment, are you satisfied that the matching approach of the endowment maximizes what can be gained from the private sector or should this matching concept be enlarged?

Mr. RUNDELL. Well, I think the matching concept is very important to do this as they have a ratchet effect. I think it does have a very important impact. For instance, one of the projects at the University of Maryland that I didn't talk about but I will now since you have asked has to do with the creation of a Jewish studies program. Well, we started with some private philanthropy from Baltimore.

Ms. STEWART. The Associated Jewish Charities and Welfare Fund of Baltimore set up a chair in Jewish history and then we came back and got I think it was a \$350,000 grant. This was several years later from NEH and that has opened the coffers of the Jewish community in both Baltimore and Washington to the University of Maryland. We have gotten untold riches or riches that we had not dreamed of before and it was the effort of the NEH that enabled us to set this thing up so that there will be programs in Jewish history and Jewish literature and Jewish language, Hebrew, this kind of thing. So the whole principle that Dr. Hardison spoke of certainly works well and I think on these grants that the matching aspect should be maximized.

Mr. REGULA. Do you have other comment on that?

Mr. LANTZ. I think the challenge is a very important aspect of most of the grants that I have seen. I think it serves very well, as he says, to loosen up funds that are not otherwise available. I guess I am a little concerned about the ease sometimes with which some grants are procured for purposes that would be accomplished without them and how one monitors that in a precise fashion I don't know.

As I said, one of the reasons we have not gotten grants is because we have not had a particular program for which we thought we ought to seek grant support. We have done a number of things, and you are well aware of these. We have not thought it necessary to depend on someone else to do it. We are very pleased about that but we are also cognizant of the fact that there are some programs and some which we may do in the future which may need such funding. Until we can demonstrate that, I don't think we ought to seek them and I do wish we had a closer and more careful way of monitoring those projects for which grants are sought.

Mr. REGULA. I am not sure that all the applicants are as conscientious as you are suggesting Mount Union College might be in seeking these grants. Again in a role of the devil's advocate here we are both familiar with the Alliance community of about 35,000 people and therefore their contribution in tax dollars to the arts and humanities is about \$35,000. What do you see as a benefit accruing to the 35,000 people in Alliance as a result of the activities of the endowment? Now that is a very pragmatic approach but

I would be curious to hear your response because we have a mutual knowledge of that community.

Mr. LANTZ. Well, before this committee some time ago, I guess it was before the Senate committee, the president of Georgetown University mentioned the encyclopedia that his school has just finished preparing. Each of these members has spoken particularly of aspects of research across the country which have been able to be procured because of the support for the endowment for the humanities. The students will benefit from the results of the national projects, there is no question about that.

Television, radio, public television, public radio—a number of these areas are aided in the Alliance area, there is no question about that. Every project undertaken by the national endowment is funded in part by the national endowments and any city in the United States will finally benefit those students and those people from Alliance who are there and they are scattered all over the country so as we benefit the nation we benefit the people from Star County. There is more that can be done and certainly that can be sought out and accomplished by a concerned citizenry and perhaps a more careful geographical distribution.

Mr. REGULA. Mr. Hardison, do you get a lot of visitations and/or research activities from all the rest of the country?

Mr. HARDISON. We have both a public and a research aspect. As a library we are a research library, our reading space is fairly limited. We went from 2,500 reader days per year in 1953 to over 10,000 reader days in the last year of full operation before we shut down and because of that not to accommodate new readers but merely to accommodate the level of usage before renovation. Part of our project is to double the size of the reading area of the library. These scholars in that last year came from 40 states and from 17 foreign countries to use the Folger library.

We also have a public dimension, we operate an exhibition gallery. They have a theater, we do 360 performances a year in our theater. We calculate that we have an average of about 175,000 people coming through either as gallery visitors or as purchasers of tickets to the theater or as participants in some of our other smaller programs.

Mr. REGULA. Now could the library at Mount Union College, the University of Wisconsin, the University of Maryland have access to your facilities by mail, for example?

Mr. HARDISON. We do about 50,000 pages in microfilm a year for people all over the world who cannot come to Washington to use our facilities. We also do various other kinds of photoduplication that are more specialized and they are kind of expensive and not as frequent as the microfilm which is the preferred method of disseminating this kind of material. We would be delighted to admit any librarian from any library to the Folger Library and we admit any qualified reader to the Folger Library.

We do have limitations on readers because anybody who gets into our reading room has access to every rare book and manuscript in our entire collection. We say we prefer readers either to be working on a dissertation or beyond or to have the professional

equivalent of a Ph. D. For an order an actor that would be reasonable credits in reasonable plays.

We have a lot of people working in embroidery in the renaissance. For an embroiderer it would be either articles on embroidery or a list of exhibitions of embroidery or something like that. I would guess maybe one-fourth of our readers are people in that category and for each reader in that category generally you have to talk to them and take a look at the credentials and so on but for an actor with reasonable credits we would not care whether the man graduated from kindergarten as long as he is truly identified and had a real need for the collection.

Mr. REGULA. Are you saying you make your resources available to the entire Nation as much as reasonably possible?

Mr. HARDISON. We do. Through our photoduplication facilities we will send out materials to anybody who writes in in this country or anywhere in the world. We are also now a member of the research libraries information network and we share graphic and cataloging or we will start to share that information as soon as the renovation is completed which we plan to be open for business after more than two years of being shut down on April 20 of this year. I invite you on April 23, Shakespeare's birthday, to come to the library to join us.

Mr. REGULA. We will be in recess.*

Mr. HARDISON. We will have an exhibition. We open then with Realms of Gold, books on the library on the renaissance, and we will be going on for about six months so please do come by and pay us a visit.

Mr. REGULA. Thank you.

We should probably move on. We have some additional witnesses here and another panel on Museum Services. Thank you.

The following statements will be made part of the record. The statement from Eileen Cooke from the American Library Association; the statement from the National Humanities Alliance, the statement by M. G. Lorberg, Jr. from the Missouri Committee for the Humanities, and the statement prepared for the record submitted by the Speech Communication Association.

Mr. HARDISON. Would you like this bit of evidence?

Mr. REGULA. You have persuaded me. I have a few books at home that are in about the same condition.

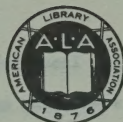
Mr. RUNDELL. Thank you.

[The statements follows:]

WASHINGTON OFFICE

AMERICAN LIBRARY ASSOCIATION

BOX 54 • 110 MARYLAND AVENUE, N.E. • WASHINGTON, D. C. 20002 • (202) 547-4440



April 13, 1981

The Honorable Sidney R. Yates, Chairman
 Subcommittee on the Interior
 House Appropriations Committee
 Room B-308, Rayburn House Office Building
 Washington, D.C. 20515

Dear Mr. Yates:

On behalf of the ALA, may I request that the enclosed statement be made part of the record of the hearings of your Subcommittee on the Interior on the FY 1982 appropriations for the National Endowment for the Humanities.

A copy of the statement has been mailed under separate cover to each member of the full House Appropriations Committee.

Sincerely,

A handwritten signature in cursive script that reads 'Eileen D. Cooke'.

Eileen D. Cooke
 Director
 ALA Washington Office

EDC:ps
 Enclosure

Statement of the
American Library Association
for the
Subcommittee on the Interior
of the
House Appropriations Committee
on the
Appropriation for the National Endowment for the Humanities

April 13, 1981

The American Library Association, an educational nonprofit organization of over 35,000 members, strongly endorses an appropriation level which will permit the National Endowment for the Humanities to fulfill the purposes for which Congress authorized it and opposes the proposed severe cut in the Endowment's FY 1982 budget. Our association submitted testimony in favor of the original legislation in 1965, and we have supported its successive extensions. The proposed cuts in the budget of the National Endowment of the Humanities would cause drastic changes in a well-received and effective federal program. The 1980 reauthorization of the National Foundation on the Arts and the Humanities did not indicate the need for a change in the direction which the Endowments have taken since their inception.

The American Library Association believes that the Administration's FY 1982 budget request of \$85,000,000 is too great a cut from the FY 1981 appropriation of \$151,299,000. This budget request represents a disproportionate decrease compared to most other federal programs and will destroy the legitimate objectives of the National Endowment for the Humanities. We cannot accept the contention that federal support for the arts and humanities is a relatively low priority budget item. The relevance of the arts and humanities to the current conditions of national life are as urgent today as they were in 1965. It is important to the well-being of the nation that the arts and humanities be fostered and encouraged as well as scientific knowledge and technical development.

It has been said that the Endowments discourage private, state and local contributions to the arts and humanities. The experience of libraries which have received challenge grants from the National Endowment for the Humanities has been that the federal funds stimulate other sources of financial support, both public and private. Challenge grants are made on a matching basis; thus, for each federal dollar awarded, institutions are required to raise three dollars in new or increased donations.

For example, the National Endowment for the Humanities awarded \$33,000 to the Cambria County Library in Johnstown, Pennsylvania, as a challenge grant. So far, \$82,000 in matching funds have been raised. By the end of this summer, the library should have their three for one match which will permit them to replace 6,600 books which were damaged by flood. The Newberry Library in Chicago received \$797,000 from the Endowment which elicited \$2,400,000 in matching funds. This money was used to renovate the library building for users and to meet increasing general administrative costs.

The Public Library of Cincinnati-Hamilton County, Ohio, used a \$375,000 Endowment grant to raise \$1,300,000. This challenge grant helped to renovate the main library department of rare books and special collections. In Pittsburgh, Pennsylvania, the Carnegie Library matched \$300,000 with \$900,000 for two purposes: to install a security system for the library and to expand specialized information services through the use of computerized data banks.

The Endowment has helped libraries to work on the serious problem of the conservation of library materials. These problems must be solved at the state and local level, but federal funds can fill an essential purpose by disseminating accurate and reliable information as widely as possible and by providing training for experts in the conservation field. Research libraries, in particular, have received

valuable assistance from Endowment funds to carry out their dual mission to make their materials available to users and to preserve the nation's intellectual heritage so that it can be passed on to future generations.

In 1979-1980, the Association of Research Libraries received \$152,000 to develop self-study procedures for research libraries to address their preservation problems. A manual for their use is slated to be published in September 1981. In order to increase the number of trained conservators, the Columbia University Library School has received an Endowment grant to begin the first formal training program for book and paper conservators. The grant consists of \$150,000 as an outright grant and \$225,000 which will be matched by several private foundations. In 1980, the Society of Northwest Archivists, based in Portland, Oregon, used a \$7,705 grant to hold workshops in Oregon, Washington, Idaho and Montana to teach disaster preparedness to the staffs of public, college and university, and historical libraries.

America's libraries and the people who use them have benefited greatly from the Endowment's programs. Awards for humanities projects in libraries reached eight million people in FY 1980 and FY 1981 through activities which stimulate the public use of libraries' humanities resources. The National Endowment for the Humanities has channeled many outstanding projects and programs through libraries which have improved the general public's knowledge of and use of humanities materials in public libraries, helped to bring together humanities scholars and the adult public, enabled many young people to sharpen their understanding of the humanities through youth projects in libraries, encouraged use by teachers and students of library resources in the humanities, improved scholarly access to underutilized research collections and created much-needed basic reference tools.

In these days of high inflation and rising costs, when libraries are hard pressed to stretch their budgets to keep up with operating expenses and to add current books and periodicals to their collections, the funds available from the

National Endowment for the Humanities have provided the means to broaden the public's access to existing library resources.

A few specific examples illustrate the dynamic library humanities projects which the National Endowment for the Humanities has funded. Two hundred libraries in eight mountain plains states, North Dakota, South Dakota, Utah, Nevada, Wyoming, Colorado, Kansas and Nebraska, are participating in a project which will focus on all aspects of rural education past and present. The Mountain Plains Library Association is presenting seminars, oral histories, exhibits and a film which brings valuable information about country schools to the public through libraries.

The "Great Plains Experience" involves ten public libraries in Arizona, Colorado, Georgia, Kansas, Minnesota, Montana, North Carolina, Texas, Wisconsin and Wyoming, in a community outreach humanities program for adults. The program will use the humanities resources of libraries and relevant works of art, artifact exhibits and special collections of museums and historical societies to interpret the history of the Great Plains to adult audiences. A major thrust of the project is to reach residents in rural areas, handicapped persons, minorities, the elderly and the less educated. The libraries were chosen to participate because they were willing to reach out across their states to all citizens. The federal grant makes this kind of comprehensive program possible.

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- 5 -

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Through programs such as these, the National Endowment for the Humanities has exercised imaginative leadership in enlarging the traditional concept of the humanities and involved an increasingly broader segment of the American public. The development of new programs, the continual updating of effective programs, their widespread publicity, and a helpful and effective staff, all contribute to the success of the National Endowment for the Humanities. The American Library Association is pleased to have this opportunity to express our interest and support for the National Endowment for the Humanities.

We would also like to call your attention to the recent report of the Commission on the Humanities, The Humanities in American Life. The Commission, established in 1978 by the Rockefeller Foundation, identified as one of its highest priorities the need for increased public support, at the federal, state and local levels, if libraries are to successfully combine their educational and preservative missions, and to make their resources in the humanities accessible to the public.

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Statement of the National Humanities Alliance

Subcommittee on Interior and Related Agencies

House Appropriations Committee

Hon. Sidney Yates, Chairman

Submitted for the Record

10 April 1981

The National Humanities Alliance is composed of organizations whose members recognize that the humanities serve fundamental national interests, and, in particular, contribute substantially to the quality of American life, both public and personal. While acknowledging that the private sector will always be the primary source of support for the humanities, Alliance members believe the federal government also has a significant role to play in this area. The members of the Alliance work together to inform the Administration and the Congress of the importance of the humanities and the need of public support for them.

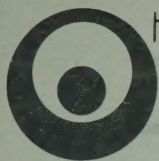
For the past fifteen years the federal government has supported the humanities through the National Endowment for the Humanities. Although the total funding of the agency has been small in proportion to the amount spent annually on the humanities nationwide, this contribution from the government has been a symbol of our nation's commitment to humanistic learning and of our concern for the culture and civilization which it promotes. Furthermore, all available information shows that funding from the NEH has stimulated new and increased support from corporations, foundations, and individuals.

The current Administration has proposed to reduce the Endowment's budget by 50%. The members of the Alliance oppose this proposal, believing it to be unduly harsh and counter productive. The Alliance wholeheartedly supports the testimony of the witnesses who, at the Subcommittee's hearing on March 24, urged that NEH funding not be cut as drastically as has been proposed.

We acknowledge that the need to control inflation requires curbing the growth of the federal budget. On the other hand, we believe that the humanities are important to the nation and should have their funding cut no more than other activities of high national interest. Therefore we urge that the Subcommittee recommend funding for NEH at a level that is a reasonable reduction from the Carter administration's proposal for FY 1982 but which still recognizes the significant role of the humanities in our national life.

National Humanities Alliance Membership:

Association of American Colleges
 American Association of Museums
 Independent Research Libraries Association
 American Association for the Advancement of the Humanities
 Council of Graduate Schools
 American Association for State and Local History
 Federation of Public Programs in the Humanities
 American Association of State Colleges and Universities
 American Council of Learned Societies
 American Association for Higher Education
 Association of Research Libraries
 American Association of Community and Junior Colleges
 National Association of Independent Colleges and Universities
 American Council on Education
 Association of American Universities
 Associated Colleges of the Midwest
 American Historical Association
 Aspen Institute for Humanistic Studies
 Community Colleges Humanities Association
 California State Universities and Colleges
 Hastings Center



the Missouri
Committee
for the
Humanities, Inc.

Suite 204, Loberg Building
11425 Dorsett Road
Maryland Heights, Missouri 63043
314-739-7368

April 28, 1981

Subcommittee on Interior of the Appropriations Committee
B 308 Rayburn House Office Building
Washington, D.C. 20515

Gentlemen:

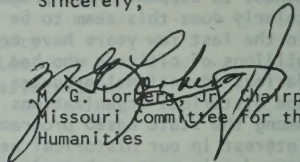
I am writing you pertaining to the 50% budget cut proposed for the National Endowment for the Humanities. While I am supportive of the administration's efforts to reduce Federal spending it does seem that to single out the National Endowment for a cut of this depth could be an error of judgment.

When one considers the purpose of the humanities and their vital contributions to the strength of the nation the amount of money expended to support their programs seems indeed quite modest. Particularly does this seem to be true with the state based programs which in the last few years have brought the humanities in contact with millions of citizens who had had indeed very limited previous contact. Various educational programs, media humanities programs, museum and historical organizations programs have been among the many popular among the state based programs. Indeed, I would suggest that our current interest in our historical heritage and historical preservation has been due in part to humanities projects from state based humanities organizations.

I personally believe it would be to all of our advantage to see at least some of the proposed cut eliminated. If this action cannot be taken, however, it would be highly desirable for funds to be redistributed within the National Endowment to permit a higher percentage of the budget to go to state based organizations. Unfortunately, the National Endowment is not planning such action in that they are planning to cut state based organizations 50%.

My position is simply this. I do not criticize any action of the National Endowment. However, the type of grants made by the National Endowment are more costly and are more limited in terms of people served. In Missouri this last fiscal year the Missouri Committee for the Humanities provided funds for thirty two large proposals (median grant \$5359.00), for fifty two mini-proposals (all \$2000.00 or less) and for four proposal development awards (the largest \$250.00). All of the projects were well attended and in most instances by adult citizens not in school. Compare these grants to a grant by the National Endowment in excess of \$54,000.00 to support the cataloging of rare books on microfilm at the Vatican Film Library or a grant also by the National Endowment of up to \$25,000.00 to support the putting together of a bibliography by or about Richard Crashaw a poet of the 17th Century. Again, let me point out that I am not particularly critical of these kinds of grants. They serve a different purpose. It is just that with finite resources state type grants that cost less and reach more people should have priority.

Sincerely,


M. G. Lorberg, Jr. Chairperson
Missouri Committee for the
Humanities

A Statement Prepared for the Record

Subcommittee on the Interior, House Committee on Appropriations

1981 Hearings on Appropriations for Fiscal Year 1982

for the

NATIONAL ENDOWMENT FOR THE HUMANITIES

Submitted by the

SPEECH COMMUNICATION ASSOCIATION

The President of the Speech Communication Association testified in support of the legislation that created the National Endowment for the Humanities in 1965. That testimony (1) identified the study of rhetoric (spoken language) as an established area of humanistic inquiry, and (2) argued the need for federal support to strengthen the teaching and research of scholars who identify with that and with other humanistic areas of study. The underlying premises recognized by Congress in creating the National Endowment for the Humanities are as valid--if not more valid--today than they were when set forth in 1965. We believe that nurture of the humanities (and the arts) is no less vital to our national interest than support for scientific and technological development. We believe that the federal government should support excellence in research and teaching in all established areas of inquiry. For these reasons, we have supported the increases in appropriations that the Endowment has experienced over the last decade.

During the past fifteen years, our organization--and many of our individual members--have benefited directly from programs of the National Endowment for the Humanities. We have observed first-hand the positive effects of modest federal investment in better scholarship, better teaching, and heightened public awareness of the nature and importance of the humanities. Specifically, the Endowment supported our Association's National Project on Rhetoric (1970), project on Black Communication (1973), and Bicentennial Youth Debates (1976). And the Endowment has supported numerous projects in research, teaching, and instructional development sponsored by individual members of the Speech Communication Association or their institutions. Although we have been direct beneficiaries of Endowment programs, our support for the agency extends well beyond our own professional interests. We believe that the health and vitality of teaching, learning, and inquiry in all areas of the humanities are directly linked to the health and vitality of the nation as a whole.

The Speech Communication Association shares the deeply-felt concerns of the humanistic community over the budget reductions proposed for the Endowment for Fiscal Year 1982. We recognize both the financial pressures that the nation is experiencing and the public's desire to reduce expenditures. However, we strongly oppose the Administration's recommendation to cut the Endowment's appropriations approximately in half. We believe that support for the Endowment should be maintained as close to present levels as possible. In relative terms, the current federal investment in the humanities is miniscule. The savings

that can be realized from even a drastic reduction in appropriations are, accordingly, miniscule. Furthermore, we fail to understand the rationale that appears to impose on the humanities (and arts), a disproportionate burden of the proposed cuts in federal spending. We believe that the harm to the national welfare that would accompany the proposed budget cut would far outweigh the cost-savings benefits.

If enacted, the suggested budget reductions would, clearly, impact negatively on that part of the educational community represented by the Speech Communication Association. We do not under-estimate the significance of that impact. More important, however, is the fact that our self-interests are but a part of a larger concern, namely, that quality teaching and research in all areas of humanistic inquiry continue to be fostered through federal support.

William Work
Executive Secretary
Speech Communication Association
5105 Backlick Road
Annandale, VA 22003

TUESDAY, MARCH 24, 1981.

INSTITUTE OF MUSEUM SERVICES

WITNESSES

ROLAND FORCE, DIRECTOR, MUSEUM OF THE AMERICAN INDIAN
 ELIZABETH H. BONNEY, MANAGER, THE PENNSBURY SOCIETY
 MRS. BERTRAM LIPPENCOTT O'NEILL, TRUSTEE OF THE MORRIS ARBORE-
 TUM, ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, AND PENN-
 SYLVANIA ACADEMY OF FINE ARTS
 GEORGE RABB, DIRECTOR, CHICAGO ZOOLOGICAL PARK
 ROWENA STEWART, DIRECTOR, AFRICAN-AMERICAN MUSEUM ASSOCI-
 ATIONS
 JEFF NORRELL

Mr. REGULA. This is the hearing on the appropriation for fiscal year 1982 for the Institute of Museum Services. We will start with Mr. Force, Director of the Museum of the American Indian, followed by Mrs. Bonney, Mrs. O'Neill, Mr. Rabb and Miss Stewart.

TESTIMONY OF ROLAND FORCE

Mr. FORCE. Thank you, Mr. Chairman.

I am pleased to be here today to offer testimony in support of the Institute of Museum Services. Just a year ago I testified before another committee of the House on behalf of the Institute and at that time I asked the Subcommittee on Post Secondary Education of the Committee on Education and Labor to both increase the level of funding for the Institute and to authorize it for a full five years.

I have with me, Mr. Chairman, a copy of the testimony that I offered at that time as published later in the year in Museum News which is the organ of the American Association of Museums. I would like to submit that with the rest of my written testimony.

Mr. REGULA. Without objection this will be made a part of the record.

Mr. FORCE. Thank you very much.

[The statement follows:]

Statement of

Dr. Roland Force, Director
Museum of the American Indian, Heye Foundation, New York, NY

Before the
Subcommittee on Interior and Related Agencies
of the

Appropriations Committee of the
House of Representatives
in Support of Appropriations for the
Institute of Museum Services

March 24, 1981

TESTIMONY OF DR. ROLAND W. FORCE ON MARCH 24, 1981, BEFORE THE SUBCOMMITTEE ON INTERIOR AND RELATED AGENCIES OF THE HOUSE COMMITTEE ON APPROPRIATIONS, HONORABLE SIDNEY YATES, CHAIRMAN.

Mr. Chairman, members of the subcommittee:

Just a year ago I testified before another committee of the House on behalf of the Institute of Museum Services. I asked the Subcommittee on Postsecondary Education of the Committee on Education and Labor to both increase the level of funding for the Institute and to authorize it for a full five years. A great deal has changed in the interim.

In its efforts to reduce federal spending, the current administration has recommended the abolition of the Institute and the rescission of funds allocated for 1981.

First I want to say that I applaud the administration's goal of reducing federal expenditures, tax reform, and the elimination of wasteful and ineffective programs. If, through these measures, inflation can be brought under control, museums, like the rest of our society, will benefit. They are being crushed by it now. Indeed, because of inflation and the rise in energy costs, most museums are in deep financial trouble.

Private philanthropy, corporate giving, and endowment income are simply not keeping pace. Deficits are being corrected by spending out of endowments. Each year the corpus is eroded and this results in steadily lower levels of annual income. Without correction there is but one inevitable outcome -- bankruptcy.

My second point has to do with the general reaction to proposed budget cuts. I have yet to hear the advocates of any program express pleasure at the prospect. And I would not care to be classed with those who seek immunity for their programs while urging that those of others suffer the knife. As I have observed the hue and cry that has arisen in many quarters these past few months I have wondered if the best approach might not have been a uniform level of cutback across the board. Such obvious equity might have made things easier.

With this preamble, then, what would I have the committee do? I would like it to urge the preservation of the Institute at a lower level of funding than has been authorized and projected. And I would like to see a review process superior to that employed in the past introduced. Finally, I would like to see the federal government utilize the Institute's continued existence as

a means of encouraging others in the private sector to provide additional basic operating support. Such support is the most difficult kind to generate. Special projects are much more appealing to the corporation or foundation or individual. Museums do not require dessert; they desperately require meat and potatoes. By its example, the government can make this point.

I believe this nation would be derelict if it did not assure the preservation of the great collections of natural and cultural history held by our museums. There is no dollar value that can be assigned to our heritage, to our patrimony. Its value is deeper than that by far. Were we to suffer the loss of any significant part of it we would be diminished as a people.

There are many who do not perceive of museums as integral to our society. How practical is a painting, a costume, a war bonnet, a Stanley Steamer, a dinosaur skeleton? Ask the question another way. How practical is knowledge, pride in our past, beauty, or aesthetic delight? How important is it to us that our spirit be buoyed periodically as we face the uncertainties of modern life?

I do not believe that the formula for awarding federal support for museums should be compromised. Politization has no part in it. Quality of collection, of program, of management should be the only criteria. And if funds are truly to be reduced -- and I have conceded that they must be -- then their award must be made with the utmost care. The profession is capable of contributing to the proper awarding procedures through peer review.

The argument that the Institute of Museum Services can be dispensed with because we got along for so long without it is invalid. The Institute was formed because there was a perceived need for it. That need still exists. In fact, the need is greater now than when the Institute was formed.

Compared with many other nations the United States spends relatively little on its cultural institutions. It spends far more on foreign aid of one kind or another. We have always been a generous country. I would not suggest that we should not help others. But I would say that I believe we may very well have exceeded our capacity to help as many others as we have and to help ourselves as well. I strongly believe in the strengthening of our own institutions. I do not believe we should attempt to feed or arm the many nations of the world at the expense of our own welfare.

Museums are exceedingly important to this nation; to the education and development of its people both today and tomorrow. If we do not preserve the institutions of today, there will be none tomorrow.

March 24, 1981

Tore

MUSEUM

NEWS

May/June 1980



The value of the service has been high since it is the only federal agency that provides grants for general operations, and also of special value to the general business community. It has been the source of all kinds of information, and because of the breadth of coverage, although its grants are relatively small, the committee has the opportunity to make an important impact. This impact is felt both with increased levels of support, and in more fully filled by students, scholars and the general public alike.

Another person, the committee is important in that he was "Constitutional"

I urge the committee to make a high priority in the maintenance of the organization that will ensure the continued value of the Institute of American Studies. I urge that the period of their operation be for the next year, and to only, larger substantially higher level of support for the activities of the next two years in his field during the current period of its existence.

Commentary

Why Museums Need Federal Support

Roland W. Force

For nearly 30 years, I have worked in museums. I believe in them, in their purpose and in their unique value to our society. I need not dwell upon the sharply increased demands that are being made upon museums, nor upon the diversity of their audiences. Both justify their support. It is necessary, I believe, to stress the substantial financial problems museums face in attempting to meet the needs and demands of their swelling audiences and to explain why federal help is required.

On Monday of this week, a group of trustees and directors of museums and other cultural and arts organizations in New York City met to discuss with corporate officials and other community leaders the particular plight of such institutions as they face ever-increasing costs. The mayor has recommended cutbacks in municipal funding of \$3.5 million for a number of city cultural organizations. At the same time, the budget for the New York State Council on the Arts remains at its 1975 level.

No one expects the federal government to take full responsibility for museums. State and local government, the corporate community and private foundations should share in this responsibility. It is important, however, that the federal government provide the leadership and initiative that will inspire other agencies to participate.

I am aware that President Carter has called for a review of the budget

with economy in mind. How can the reauthorization that is sought, particularly at increased levels of funding, be justified? Simply because we need the research that is carried on in museums. Because we need access to the remnants of our past that give us an identity. Because we need the exposure to great works of art. If the organism is to survive, the soul, too, must be nurtured.

Because there is a clear national need for them and for their services, museums merit federal support. They merit it from the several federal agencies that provide it, the National Endowments for the Arts and the Humanities, the National Science Foundation, the Smithsonian via the National Museum Act and the Institute of Museum Services. They merit it because with their collections and programs our nation is enriched, it is rendered more capable of facing a complicated and difficult time in history.

Sometimes recourse to history helps make a point. In 1770, the noted explorer Samuel Heame left Fort Prince of Wales on the northwest shore of Hudson's Bay for the vast uncharted regions known then as the Barren Grounds, now called the Northwest Territory. For two years, accompanied only by Indian guides, he trekked for 5,000 miles across the Arctic tundra. At times, the temperatures were 50 degrees below zero and winds of 60 and 70 miles-per-hour velocities were encountered. He met few natives.

On one occasion, he came upon the snowshoe tracks of a single traveler. He followed them and ultimately came upon a rude shelter nearly covered by snow. Inside was a young Indian woman, totally alone in the immense wilderness. Through his guide, Heame learned that the girl had survived a raid upon her family band some months before by a group of marauding enemies. All had died except the girl and her baby, who were taken prisoner. Later, after her child was killed by her captors, she escaped into solitary exile, fending for herself in the rigorous climate.

The remarkable thing Heame noted was that despite her isolation and deprivation, the young woman was carefully groomed and attired in beautifully wrought garments. Even in the face of the harshest of conditions, she not only survived, but did so while preserving art and beauty. In the end, she preserved her dignity as a human being. Her salvation lay in the fact that by her behavior, she had *denied* her *nothingness*.

Although the point has been made many times, it bears repeating. Without the inspiration and satisfaction of things esthetic, the human spirit that is beset with adversity, with the harshness of life, will falter and ultimately perish.

As we enter the last decades of the 20th century, the environment in which we live is as harsh and unforgiving as that which confronted the Indian girl in the bleak northern wastes 200 years ago. Among its threats are nuclear holocaust, pollution, terrorism, resource depletion, inflation, drug addiction, loss of personal identity, stress, crime, disease and inadequate food production.

Basic support for museums will not guarantee a cure for cancer, assure detente, decrease reliance on fossil fuels or solve the problems of overpopulation. It will not stop the hijacking of aircraft, takeovers of embassies or organized crime. It will have little effect upon the buying power of the dollar or the unfavorable balance of trade. But it can have a profound impact upon our ability to survive in a world that is increasingly filled with threats to our collective and individual welfare.

Basic support for museums can provide for the preservation of our heritage, both natural and cultural. Heritage is just as much a nonrenewable resource as natural gas or copper. And its preservation deserves equal attention. Support for museums can help them continue to provide surcease from the stress of modern urban life as quiet refuges in which humans can identify with the greatness of artistic creativity,

ROLAND W. FORCE, who is director of the Museum of the American Indian-Heeye Foundation, New York City, gave this testimony at reauthorization hearings for the Institute of Museum Services, held March 5 by the House Committee on Education and Labor subcommittee on postsecondary education.

Commentary

appreciate the wonders of the earth, and renew and discover a pride in their past. The public demand on museums—art, history and science—has never been greater. Everything the Belmont Report said in 1967 about the growth of interest in museums and about their plight holds true today.

Nearly 11 years ago, speaking before the 64th Annual Meeting of the American Association of Museums, Congressman Brademas stressed that museums, despite the existence of national questions and problems of great magnitude, must be viewed as "important in their own right." If they are so viewed, he said, then "an effective public policy" for museums is possible. In the intervening years the recognition that museums are indeed important has become much more widespread. Increased appropriations and levels of support for museum activities have achieved the beginnings of an effective public policy. The creation of the Institute of Museum Services as an agency of the federal government specifically mandated to provide support for these valuable institutions is a substantial indication of the growth of this policy.

In little more than two years, the institute has been tested. And it has been found to work. Its pilot phase is completed. Now, so that it may move on to become completely operational, it requires two things: reauthorization for a full five years and a significantly increased level of support so that it may have the necessary impact upon the museums of our country.

The value of the institute lies in the fact that it is the only federal agency that provides grants for general operations, the area of need that is the greatest for most museums. It services museums of all kinds and of all sizes. And because of the breadth of coverage, although its grants are relatively small, the institute has the opportunity to make an exceptional impact. This impact is felt (and with increased levels of support, can be more fully felt) by students, scholars and the general public alike.

Another reason the institute is important is that its new "Cornerstone"

Commentary

grants, and the opportunity they afford for multiyear funding, provide a vehicle for encouraging and stabilizing long-range planning. Such planning is vital in times when costs for both personnel and energy are so rapidly rising. Planning is essential if treasures are to be protected and the public welcomed in the many museum buildings that were constructed before anyone dreamed of an energy crisis.

The use of public funds to support museums that in so many cases were founded and supported in earlier times by private philanthropy represents a change in our society. Among other things, tax reform has caused philanthropic patterns to change. Private support is more difficult to secure today. At the same time, it is fair to say that the part of society that bears a major tax burden—the middle-income segment—also happens to constitute the preponderant number of beneficiaries of museums. There is a major justice in this. One measure of how important

something is has to do with the degree to which there is a demonstrated need. Museums clearly have a fiscal need. My own institution is a case in point. Endowment income provides only about one-quarter of the annual budget; all the rest must be generated from other sources. I can speak first-hand about the value of the grant we received from the institute last year.

Clearly, museums are a valuable feature of our life. People need them. Museums must satisfy their own needs before they can attempt to satisfy those of society.

I urge the committee to award a high priority to the reauthorization of the legislation that will assure the continuation of the Institute of Museum Services. I urge that the period of this authorization be for five years. And, finally, I urge a substantially higher level of support for the activities of the institute than it has had during the experimental phase of its existence.

Mr. FORCE. As we all know, a great deal has changed in the past year. In its efforts to reduce Federal spending the present administration has recommended not just a reduction of funds for the Institute but its abolition and indeed a rescission of the funds allocated for 1981. First I want to say that I applaud the administration's goal of reducing Federal expenditures, tax reform and the elimination of wasteful and ineffective programs. If through these measures inflation can be brought under control, museums, like the rest of our society, will benefit. They are being crushed by it now. Indeed, because of inflation and the rise in energy costs, most museums are in deep financial trouble.

Private philanthropy, corporate giving and endowment income are simply not keeping pace. Deficits are being corrected by spending out of endowments. Each year the corpus is eroded and this results in steadily lower levels of annual income. Without correction there is but one inevitable outcome—bankruptcy.

My second point has to do with the general reaction to proposed budget cuts. I have yet to hear the advocates of any program express pleasure at the prospect, and I would not care to be classed with those who seek immunity for their programs while urging that those of others suffer the knife. As I had observed the hue and cry that has arisen in many quarters these past few months I have wondered if the best approach might not have been some sort of uniform level of cutback across the board. Such obvious equity might have made things easier. As it is, people make comparisons.

Now with this preamble what would I have the committee do? First I would like it to urge the preservation of the Institute at a lower level of funding than has been authorized and projected. I have heard others who testified earlier today insist upon the importance of even raised appropriations for the Endowments for the Humanities. I certainly support that funding agency, my own organization has benefited greatly from it but I believe to do so in the face of prevailing conditions would be injudicious. What we are seeking here is an opportunity to maintain the Institute even if it has to be at a lower level of funding.

The next thing I would like to urge upon the committee is that with the continuation of the Institute a review process superior to that employed in the past be introduced. Finally, I would like to see the Federal Government utilize the Institute's continued existence as a means of encouraging others in the private sector to provide additional basic operating support. Those who have testified earlier today have been uniform in their conclusions that the Federal Government had a very direct role in the encouragement of private support; that is, support from the corporate community in particular. I believe this to be true.

When it comes to basic operating support it is perhaps even truer because such support is the most difficult kind to generate. Special projects are much more appealing to the corporation or foundation or individual. Museums do not require dessert, they desperately require meat and potatoes and by its example in assisting museums of this country the Government can make this point.

I have with me a copy of a catalog issued by my Institution the last year or so and in it there is a significant acknowledgement. One of the endowments, the Endowments for the Humanities, pro-

vided a grant of \$221,000 in support of the exhibit this catalog covers. Included is an acknowledgement of that award and also included is an acknowledgement of support from the Atlantic Richfield Foundation, the Phillips Petroleum Foundation, the Citibank and a number of other corporations. I am certain that these corporations were influenced by the initial support provided by the endowment by the Federal Government.

I believe this Nation would be derelict if it did not assure the preservation of the great collections of natural and cultural history held by our museums. There is no dollar value that can be assigned to our heritage, to our patrimony. Its value is deeper than that by far. Were we to suffer the loss of any significant part of it, we would be diminished as a people.

As perhaps some of you did, I sat and watched Mr. Hardison help a book to disintegrate and that troubled me. I am certain he picked an inappropriate or a blank page, but it still bothered me. That problem exists not only in libraries but it exists in the museums of this country generally.

Perhaps some of you would be surprised to know that leather when exposed to sunlight and heat turns to a gummy mass. I have two jars of it in my museum, they used to be Indian artifacts.

There are those, however, who do not perceive of museums as very integral to our society. How practical is a painting, a costume, a war bonnet, a Stanley Steamer, a dinosaur skeleton? Ask the question another way. How practical is knowledge, pride in our past, beauty, or aesthetic delight? How important is it to us that our spirit be buoyed periodically as we face the uncertainties of modern life?

I do not believe that the formula for awarding Federal support for museums should be compromised. Politization has no part in it. Quality of collection, of program, of management should be the primary criteria. If funds are truly to be reduced, and I have conceded that they must be, then their award must be made with the utmost care. In my view the profession is capable of contributing to the proper awarding procedures through peer review.

The argument that the Institute of Museum Services can be dispensed with because we got along for so long without it is in my view an invalid one. The Institute was formed because there was a perceived need for it and that need still exists. In fact, the need is greater now than when the Institute was formed.

Compared with many other nations, the United States spends relatively little on its cultural institutions and I am aware that would differ with the point I wish to make now. We have always been a generous country and I am not suggesting that we should not help others, but I would say that I believe we may very well have exceeded our capacity to help as many others as we have attempted to help and to help ourselves in critical areas as well. I do not believe we should attempt to feed or arm the many nations of the world at the expense of our own welfare.

As a museum professional I feel a very great welfare need in this area. I heard General Gavin speak this morning of the importance of understanding the cultures of other nations. I would not want what I have said here to appear to be an isolationist point of view, I am well aware that the United States has a leadership role in

international relations. I am well aware that we need to provide counsel, guidance, assistance, and we need to work in cooperation with those of other countries. There is a way that we can do this, there are many ways that we can do this, and if our own cultural institutions are stronger I think we can do it better.

The catalog to which I made reference a few moments ago is for an exhibit of American Indian culture. For the past three years or so I have been attempting to generate support to take this exhibition to the People's Republic of China but I have not raised the necessary money to do it. I still think we should do it and I think there should be an involvement; if not a dollar involvement, then at least an acknowledgement and a blessing of this project as we return a major exhibit to a country that has sent us at least two. I believe that, to return to the humanities endowment, the first step was made or the first stone was laid when the initial grant was made in support of this project.

I will conclude, Mr. Chairman, with this simple comment: that museums are exceedingly important to this Nation and to the education and development of its people, to both those who are living today and those who will live tomorrow. If we do not preserve and protect the institutions of today, there will be none to protect tomorrow.

Thank you very much.

Mr. REGULA. Thank you, Mr. Force.

Ms. Bonney.

TESTIMONY OF ELIZABETH BONNEY

Ms. BONNEY. Thank you.

I represent the Pennsbury Manor. I am grateful to this committee for the opportunity to present testimony in support of the Institute for Museum Services.

Our Administrator was not able to be here today as scheduled but it is very appropriate that I represent our site. I manage The Pennsbury Society, a nonprofit community support organization which is associated with Pennsbury Manor, a government-operated museum. I am here today to assess the impact of the rescission of funding on the Institute of Museum Services on new historic sites like Pennsbury Manor with an operating budget of less than a half million dollars.

Congressman AuCoin pointed out, at the hearing for the Humanities, how important this type of funding is for small institutions. My testimony may be parochial but Pennsbury Manor is typical of many IMS grantees. I will try to give a summary of the written testimony which has been presented to the committee.

Pennsbury Manor is the country plantation of William Penn, founder and first Governor of Pennsylvania. It is a 43-acre documentary historic site located on the Delaware River in Bucks County, Pennsylvania. The collections are diverse and include historic buildings, decorative-arts artifacts, gardens, historical clothing and domestic farm animals. In the last two years, due largely to greatly expanded public programming and the attendant publicity, our visitation has increased nearly 66 percent. The site is a major tourist attraction for the local community and contributes significantly to its economy through the tourist dollars expended.

Pennsbury Manor is owned by the Commonwealth of Pennsylvania and is operated by the Pennsylvania Historical and Museum

Commission. The Pennsbury Society is a locally-based membership group which is under contract with the Commission to support the programmatic activities at the site. Our total operating budget for 1980 was nearly \$380,000.

Mr. REGULA. Do you charge a fee to visit?

Ms. BONNEY. Yes, we do. We charge \$1.50 per adult visitor, nothing for children under 12 or adults over 65.

Mr. REGULA. Mr. Force, do you charge a fee?

Mr. FORCE. Yes, sir, we do. We have a \$1.50 fee for adults, organized groups of adults or children 25 cents.

Ms. BONNEY. Volunteer services in the last three years have grown from less than 150 hours per year to nearly 10,000 hours of contributed services in 1980. We now have more than 80 volunteers who serve in a variety of capacities. This community commitment is most significant in our goal of achieving the potential of Pennsbury Manor and has been greatly enhanced through IMS support.

Although I am here primarily to give testimony for IMS, I would like to call the attention of the committee to the impact of the research and planning grant to The Pennsbury Society in 1978 from the National Endowment for the Humanities for \$26,000. Much of the expanded interpretation and programming at the site today is due to the "seed money" given Pennsbury for a single year.

More than \$80,000 of private support has been raised in the intervening three years to implement the plans which were developed through NEH support. The impact of this one grant is still being felt at Pennsbury Manor in that we have been able to define and document our interpretive and collection goals and successfully seek private support for their implementation.

To date, 1980/81 General Operating Support in the amount of \$25,000 from IMS has allowed Pennsbury Manor to add to our staff an education program coordinator, a bookkeeper and a volunteer coordinator. We have only had IMS support since October of 1980 but the multiplier effect has been immediately apparent in that we have added 36 trained volunteers to our unpaid staff and have increased visitation in this six month period by nearly 90 percent over a comparable time frame for the previous year. We have also been able to conserve four major pieces from the collection and to fund a professional audit of The Society's financial records.

The programs developed by our education coordinator have been targeted primarily at school children but also include average to senior citizens and community groups and area colleges. If IMS support is rescinded in 1981, our paid visitation would have to increase from 10,000 visitations at \$1.50 per person to 33,500 in order to recover this loss of income. A 250 percent increase in paid visitations in a single year is obviously unrealistic.

There are a number of other reasons why the threat to the continued existence of IMS has us deeply concerned. Historically, general operating support has been the most difficult funding to generate. Inflationary pressures on museums have forced many into deficit budgeting and/or severe program cutbacks. For the past three years, IMS support has enabled many institutions to sustain their programming and preservation efforts and, most importantly, to fulfill their roles as public trustees for collections and

buildings which have been given in trust by past generations for preservation for future generations.

Federal Government leadership in awarding funds for general operating support to museums has begun to stimulate the private sector to re-evaluate their giving patterns from special projects and exhibits to general institutional support. Complete rescission of IMS funding at this point may seriously damage the awakening of public concern for general museum operations. In Pennsbury Manor's case, Federal support has been at least partly responsible for an increase in our State appropriation from \$185,000 in fiscal 1978/79 to \$301,000 in fiscal 1980/81. I would not like to contemplate the consequences at the state level of a major philosophical change in the attitude of the Federal Government toward operating funding.

The very existence of IMS expresses a strong commitment on the part of the Federal Government to promoting local grassroots endeavors in small and mid-sized government to promoting local grassroots endeavors in small and mid-sized history related museums. It is difficult to imagine a Federal granting program that has done more to raise an institution's credibility in its own community or to stimulate more local support of these vital cultural resources.

The application process itself is an excellent vehicle for self-evaluation and long-range planning for all institutions who seek IMS support in that it forces museums to take time once a year to assess where they are and where they are going.

We have applied for a grant from IMS for fiscal 1981/82 which is critical for the continuation of the salaries and related expenses necessary to sustain the programs initiated this year. We anticipate that by 1983 most of these programs will be self-supporting; however, in our planning, 1981 and 1982 were considered to be pilot years for developing and refining our interpretive and educational goals. Without IMS support our artifact conservation program which was begun in 1980 will be delayed indefinitely. The site is now physically accessible to the handicapped but program revisions to accommodate those with vision, hearing and mental limitations cannot be fully implemented without trained staff.

Rescission of IMS support will not close Pennsbury Manor. At least for fiscal year 1981/82, State government funding will be sufficient to provide necessary maintenance, security, clerical and administrative staff. What is at stake, however, is the status of our forward progress. Federal government funding has been a tremendous force in helping to realize Pennsbury Manor's potential as a major historic site.

In the application process for 1981, there are no guarantees that Pennsbury Manor will receive IMS funding; yet it would be tragic if none of America's museums received this critical operating support. The necessity for Federal cutbacks is clear but I feel that museum programs and operations are being asked to assume more than their fair share of these budget cuts. A reasonable percentage cut in IMS funds is undoubtedly inevitable; a total rescission of funds is unconscionable.

The responsibilities of America's museum community to preserve and interpret the collective cultural heritage entrusted to it are awesome. These responsibilities are difficult to meet in a decade of

double-digit inflation. It cannot be assumed that the private sector will be immediately able to fill the gap left by IMS. IMS support has been a unique program which has helped America's museum resources meet rapidly escalating costs. Cutbacks would not only reduce services but jeopardize the very collections that these museums were established to preserve. While the decade of the 1980's is certain to bring dramatic changes to the totality of the American way of life, we as a society cannot ignore the cultural and historical heritage that has made us the great nation that we are today.

Thank you.

Mr. REGULA. Thank you.

Your statement will be made a part of the record.

[The statement follows:]



THE PENNSBURY SOCIETY

Pennsbury Manor
Morrisville
Pennsylvania 19067

TESTIMONY GIVEN BEFORE THE SUBCOMMITTEE ON INTERIOR AND RELATED
AGENCIES OF THE HOUSE APPROPRIATIONS COMMITTEE - MARCH 24, 1981

Elizabeth H. Bonney
Manager, The Pennsbury Society

I am here today to present the case of the impact of the rescission of funding from the Institute for Museum Services on mid-sized historic sites with operating budgets of less than \$500,000. In fiscal year 1980, 35% of IMS funding was awarded to history museums and historic houses which account for 50% of the nation's museums. Additionally, 37% of the total awards went to institutions with operating budgets of from \$100,000 to \$500,000 per annum. Therefore, it is particularly appropriate that Pennsbury Manor present testimony today, as it is a site representative of a significant portion of the museum community in America. The impact of the total loss of IMS funding to these small history-related museums would be devastating.

Pennsbury Manor, the country plantation of William Penn, Founder and first Governor of Pennsylvania, is a 43-acre documentary historic site located on the Delaware River in Bucks County, Pennsylvania. The Manor was reconstructed on the site of the original buildings in 1939 by the Commonwealth of Pennsylvania to interpret Penn's accomplishments as well as social, cultural and material life of Pennsylvania between 1683 and 1720. Today, Pennsbury Manor is the only extant residence of William Penn where the public can visit a documented home of the man who was instrumental in the founding of three of the original 13 colonies (Pennsylvania, New Jersey

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and Delaware). Penn was also the founder and planner for the city of Philadelphia and an early proponent of representative government, freedom of conscience, individual rights and ethnic pluralism.

As the home of the founder of Pennsylvania, Pennsbury Manor has obvious state and national significance; however, its impact on its local community can be measured in many ways. Within the greater Delaware Valley (a region which includes parts of Pennsylvania, Delaware and New Jersey), there are more than 5 million people. Our immediate community is Lower Bucks County, an area of heavy industry and dense residential development whose population in 1980 was 247,952, with a diverse economic, ethnic and racial configuration. As an agricultural oasis in a semi-urban region, Pennsbury Manor is a prime cultural resource, as well as a major historic site and tourist attraction. A significant emphasis in the last three years has been to effect programs at the site that will make it a local cultural focal point. These programs have included film series, temporary art and photography exhibits, and workshops and seminars on a variety of subjects.

The collections at Pennsbury Manor are diverse and include historic buildings, decorative-arts artifacts, gardens, historical clothing, and domestic farm animals. These collections have been selected to interpret the life patterns of the Penn family and the servants at the plantation between 1680 and 1720. The material object collection is one of the largest holdings of the decorative arts from the late 17th and early 18th centuries. Recent acquisitions of reproduction artifacts have allowed us to expand our programs to hands-on living interpretations.

In the last two years, due largely to greatly expanded public programming and the attendant publicity, our visitation has increased nearly 66%, from

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23,000 in 1978 to 35,000 in 1980. More than 50% of these visitors live within 30 miles of the site and many are repeat visitors. Nearly 12,400 of 1980's total visitation were school children in organized groups for whom there is no charge at the present time. The site is a major tourist attraction for the local community and contributes significantly to its economy through the tourist dollars expended.

Pennsbury Manor is owned by the Commonwealth of Pennsylvania and is operated by the Pennsylvania Historical and Museum Commission. In addition, a locally-based membership group, The Pennsbury Society, has entered into a contract with the Commission to support the activities at the site. Our operating budget for 1980 was \$379,911 and can be summarized as follows:

State Government Appropriation and earned income	\$293,330
The Pennsbury Society	\$45,081
Contributed Services/Materials	\$41,500

The Pennsbury Society's operating statement for 1980 included \$6,252 from the Institute for Museum Services (part of a total award of \$25,000 for fiscal year 1980/81.)

Volunteer services in the last three years have grown from less than 150 hours per year to nearly 10,000 hours of contributed services in 1980. We have more than 80 volunteers at the present time who serve in an infinite variety of capacities: as interpreters and educators, as clerical help, as attorneys and public relations specialists, as personnel for our sales store, and as hot dog cookers, etc., for our numerous special events. This community commitment is most significant in our goal of achieving the potential of Pennsbury Manor and has been greatly enhanced through IMS support.

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In 1978, Pennsbury Manor received a research and planning grant of \$26,000 from the National Endowment for the Humanities. Much of the expanded interpretation and programming at the site today is due to the "seed money" given Pennsbury for a single year. We were able to hire one fulltime employee, one parttime employee and six consultants who gave us professional guidance in historical clothing for our guiding staff, an audio-visual orientation program for the visitor center and in documentation for physical changes to the major historic buildings. More than \$80,000 of private support has been raised in the intervening three years to implement the plans which were developed through NEH support. The impact of this one grant is still being felt at Pennsbury Manor in that we have been able to define and document our interpretive and collection goals and successfully seek private support for their implementation. With the addition, in 1980, of \$25,000 of federal dollars from IMS, Pennsbury Manor is systematically moving to achieve its established priorities.

To date, 1980/81 General Operating Support for Pennsbury Manor has allowed us to add three individuals to our staff: a fulltime education program coordinator, a parttime bookkeeper and a parttime volunteer coordinator. The bookkeeper has allowed us to improve vastly The Pennsbury Society's accounting practices. The education program coordinator and the volunteer coordinator have been working together to expand our on-site educational programs, to train volunteers to assume a greater role in our growing out-reach program, and to improve upon the quality and quantity of volunteer commitment to Pennsbury Manor. With these staff additions, existing staff have been able to concentrate on fund-raising and membership

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development. We have only had IMS support since October of 1980; however, the multiplier effect has been immediately apparent in that we have added 36 trained volunteers to our unpaid staff and have increased visitation in this 5-1/2 month period by nearly 90% over a comparable time frame for the previous years. We have also been able to conserve 4 major pieces from the collection in order to avert further physical damage and to fund a professional audit of The Society's financial records.

The programs developed by the education program coordinator have been targeted primarily at our school visitation; however, we have also been working with senior citizen groups, community youth groups (such as the scouting programs), and the area colleges. The impact of IMS support in the long-run will be significant in both improved quality in programming efforts and in expanded visitation, which will ultimately help to defray the attendant operating costs. However, if IMS support is rescinded for 1981/82, paid visitation would have to be increased from 10,213 at \$1.50 to 33,547 in order to cover this loss of income. This 250% increase in paid visitation in a single year is obviously unrealistic. At the Mercer Museum in Doylestown, Pennsylvania (which also received IMS support in 1980), an increase of 100% in paid visitation would be necessary to compensate for the loss of \$35,000 of IMS support.

There are a number of other reasons why the threat to the continued existence of IMS has us deeply concerned. Historically, general operating support has been the most difficult type of funding to generate. Inflationary pressures on museums have forced many into deficit budgeting and/or severe program cutbacks. For the past three years, IMS support has enabled many institutions to sustain their programming and preservation efforts and, most importantly, to fulfill their roles as public trustees for collections

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and buildings which have been given in trust by past generations for preservation for future generations. Federal government leadership in awarding funds for general operating support to museums has begun to stimulate the private sector (foundations, corporations and individuals) to reevaluate their giving patterns from special projects and exhibits to general institutional support. However, three years is not a sufficient time period for the full benefits of this impetus to be felt. Complete rescission of IMS funding at this point may seriously damage the awakening of public concern for general museum operations. In Pennsbury Manor's case, federal support has been at least partly responsible for an increase in our state appropriation from \$185,000 in 1978/79 to \$301,000 in 1980/81. I would not like to contemplate the consequences at the state level of a major philosophical change in the attitude of the federal government toward operating funding.

The very existence of IMS expresses a strong commitment on the part of the federal government to promoting local grassroots endeavors in small and mid-sized history related museums. It is difficult to imagine a federal granting program that has done more to raise an institution's credibility in its own community or to stimulate more local support of these vital cultural resources. This multiplier effect at Pennsbury Manor has been dramatic in terms of programs, volunteer personnel and increased funding.

There have been several indirect benefits of IMS support at Pennsbury Manor. The application process itself is an excellent vehicle for self-evaluation and long-range planning for all institutions who seek IMS support. It forces museums, particularly small ones with minimal staff that are bogged down in day-to-day problems, to take the time once a year

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to assess where they are and where they are going. Planning and looking to the future with optimism are essential to the total health of this nation's museums. Additionally, when Pennsbury Manor first applied for IMS support in 1978 (unsuccessfully, I might add), the site was not fully accessible to those with mobility limitations. Since that time, the Pennsylvania Historical and Museum Commission has committed nearly \$50,000 of capital money to the site for a variety of adaptations which are being used as a pilot project for the Commonwealth's 44 state-owned historic sites.

We have applied for a fiscal year 1981 grant from IMS which is critical for the continuation of the salaries and related expenses necessary to sustain the programs initiated this year. We anticipate that by 1983, most of these programs will be self-supporting; however, in our planning, 1981 and 1982 were considered to be pilot years for the development and refining of our interpretive and educational goals. Without IMS support, our artifact conservation program which was begun in 1980 will be indefinitely delayed. While the site is now physically accessible to the handicapped, program revisions to accommodate those with vision, hearing and mental limitations will not be fully implemented without trained staff. Rescission of IMS support will not close Pennsbury Manor. At least for fiscal year 1981/82, state government funding will be sufficient to provide necessary maintenance, security, clerical and administrative staff. What is at stake, however, is the status of our forward progress. Federal government funding has been a tremendous force in helping to realize Pennsbury Manor's potential as a major historic site.

In the application process for 1981, there are no guarantees that Pennsbury Manor will receive IMS funding; however, it would be tragic if

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none of America's museums received this critical operating support. The necessity for federal cutbacks is clear; however, I feel that museum programs and operations are being asked to assume more than their fair share of these budget cuts. A reasonable percentage cut in IMS funds is undoubtedly inevitable; however, a total rescission of funds is unconscionable.

The responsibilities of America's museum community to preserve and interpret the collective cultural heritage entrusted to it are awesome. These responsibilities are difficult to meet in a decade of double-diget inflation. IMS support has been a unique program in that it has helped America's museum resources to meet rapidly escalating costs (heating, electricity, salaries, etc.) without cutbacks in these areas, cutbacks that would not only reduce services, but jeopardize the very collections that these museums were established to preserve. The decade of the 1980's is certain to bring dramatic changes to the totality of the American way of life; however, we, as a society, cannot ignore the cultural and historical heritage that has made us the great nation that we are today.

Mr. REGULA. Do you have memberships in Pennsbury Manor in the local community that are used to support its activities?

Ms. BONNEY. Yes, we do.

Mr. REGULA. How many members?

Ms. BONNEY. We have close to 200 members at the present time and three years ago we had less than 50.

Mr. REGULA. Do you make a continued effort to expand your membership list?

Ms. BONNEY. We are right now and we are doing it because of an increased staff through IMS support.

Mr. REGULA. How about in your case?

Mr. FORCE. Yes, we have increased our membership about 100 percent this past year by going to a direct mail campaign. We have 1,750 members which produces \$35,000 in income annually; it is the largest we have ever had.

Mr. REGULA. Mrs. O'Neill, Trustee of the Morris Arboretum in Philadelphia.

Incidentally, without objection, your entire statement will be made a part of the record.

TESTIMONY OF MRS. BERTRAM LIPPENCOTT O'NEILL

Mrs. O'NEILL. Mine is going to have to be sent, I am afraid. I wrote it on the train so I don't think you could read it too well.

Mr. REGULA. We will hold the record open.

[The statement follows:]

Thank you Congressman Yates, Members of the Committee, for giving me this opportunity to testify in today's hearing. I am Jane O'Neill (Mrs. Bertram O'Neill); I live in Philadelphia, where I am a member of the Board of Managers of the University of Pennsylvania and a Trustee of the Academy of Natural Sciences. I have been active in the museum community of Philadelphia for most of my life as a member on a number of Boards and fund raising committees, and also as a contributor to many of these institutions. I have had a professional life, too, so I am aware of "budget agonies".

I am here to speak on behalf of the Federal government's involvement in museums, and against the Administration's proposed rescission of the Institute of Museum Services' appropriations. Let me say that I am all for budget trimming. It is imperative. It is the inequitable percentage of the trim in our case, and the timing. If we are to re-think Federal involvement in cultural activities, let us first re-think it and then form a policy before acting on "no policy". Such precipitous action would dismantel programs in museums that are needed to protect and interpret collections to the public, and eliminate funding that is required to stimulate support from the private sector. Closed galleries, roped off areas, etc., which will inevitably result, will most certainly have the effect of discouraging gifts from private donors—the old "good money after bad" syndrome. I agree the private sector should be the major source of support in "a healthy economy". But give use time to marshal our forces and the economy a slight period to get "healthy".

Much of this nation's historic heritage is preserved in the museums of Pennsylvania. This heritage is represented in the form of living collections, specimen trees and rare and endangered animals, works of art and priceless manuscripts and documents. These repositories, in which I may add the government has considerable investment, represent a national trust that must be passed to future generations. The General Operating Service provided by the Institute of Museum Services is critical for the preservation (that means just holding the line) of these collections. Operating expenses are very unpopular with Corporations and Foundations. Last year, IMS awarded \$726,455.00 to the museums of Pennsylvania, of which \$417,282.00 was given in support of Philadelphia museums. The proposed rescission of funding would strand many of these institutions, not give them time to develop other resources, and in so doing jeopardize the institutions' ability to adequately protect our priceless national heritage. This would be true all over the nation. Our cultural institutions have come a long way out of the dark ages where they were before government involvement. If we slip back now before we can re-group and find other sources, it will be far more costly to come back. Without climate control, guards, curatorial staff, etc., our cultural institutions will become a national disgrace. As Hobert Rowen, financial writer for the Washington Post remarked,

"Surely America is still big and wealthy enough to help finance guards at museums and public broadcasting, and still spare something for the Arts and Humanities." To this I add our museums serve as a reclame for the United States, a window for the outside world and an attraction to foreign visitors.

The collections of museums are the documents of our cultural heritage. We need to interpret to each generation anew this heritage. Museums are the fountain heads of informal education which have become such an important part of our lives. In recent years they have indeed become an integral part of the educational enterprise, not simply a day out of school. As the average age of the population has become older, the demand for museum programs has intensified. IMS funding has helped expand audiences and linked museums with the traditional educational establishment. Recission of IMS funding would eliminate these programs at a time when the need has never been greater. I seem to detect a government attitude that museums are elitist. Quite the contrary, museums serve those who could not afford otherwise to see beauty, be it art, flora, or fauna. More people visited museums in Philadelphia last year than attended all the sports events combined; and Philadelphia is a great sports town.

Finally, I would like to state that Federal funding in the case of IMS has not driven private dollars out. Quite the opposite; it has stimulated them. In my own case, and I believe this is also true of many contributors to museums, I like to give to an institution that has a clear idea of how it serves and where it is going; and I have spend a lifetime in fund raising. IMS funding has given institutions such as the Morris Arboretum and the Academy resources to develop long range plans. IMS has had an enormously positive influence on all these institutions. In this and in many other ways, it has strengthened the institutions ability to raise private dollars. Eliminating funds that have already been appropriated for fiscal year 1981 would be damaging to say the least. As Yale University's President put it "We will have been mugged!"

In conclusion, I would say that the protection and interpretation of the cultural heritage of this country is not just a matter of concern for the private sector. It is a national concern, just as much as defense is a national concern. And I don't begrudge national defense one penny. We are in sore need there. Federal leadership in the support of museum programs is critical. I strongly urge the defeat of this recission and the strengthening of the Federal-private sector partnership.

Again, let me say, I strongly favor putting the major part of the burden on the private sector. I am sick and tired of the "the government should do it" attitude. After all, who is the government in a free (?) enterprise system and semi-democracy such as ours? We are. But I have found the relatively small government funding from IMS to be an enormous lever in raising private funds. It is a stamp of approval. It is a leadership gift. It enables the two museums on whose Boards I currently sit and those others with which I have an intimate relationship to have a focus and a well coordinated set of programs and goals. Proof of the pudding is that, with the inception of government support of cultural activities, the growth of corporate giving increased from twenty-two million in 1965 to four hundred thirty-five million in 1979.

I repeat, I know cuts are necessary. We accept that. But recission is too drastic and too fast. It isn't equitable to other budget trims. And the amount involved nationally is so minute to all but the museums involved.

Mrs. O'NEILL. Congressman Regula and members of the committee, I want to thank you for being able to testify today.

I think my testimony may be somewhat redundant because I think Mr. Force must have been ESPing me all the way down on the train since a great deal of what he said I say, too, because we are both living in the museum community in a rather large capacity. I am not only on the board of managers of the Morris Arboretum of the University of Pennsylvania but I am also a trustee of the Academy of Natural Sciences in Philadelphia and I have served on many other museum boards. I spent most of my life in fund raising and therefore I am aware of the difficulty of raising funds and obtaining grants.

I have also had a professional life so I am aware of the budget agonies that all of you are going through. I am here to speak, of course, on behalf of the Federal Government's involvement in museums. I am against the administration's proposed rescission of the

Institute of Museum Services appropriations. I want to say to Mr. Force that I am all for budget trimming, it is imperative and it is the inequitable percentage of the trend in our case. Someone who testified this morning said not a hammer but a cleaver. I say not a clever but a laser gun is the end.

Such precipitous action would really dismantle the programs in museums that are needed to protect and interpret the collections of the public. I will eliminate the funding that as so often has been stated is the stimulus for raising funds from the private sector. Closed galleries and roped off areas which was inevitably to surface if we haven't the extra funding will most certainly have the effect of discouraging gifts from a private donor. It is the old syndrom of throwing good money after bad.

It is agreed that the private sector should be the major source of support in "the healthy economy" but let's have a little time to marshal our forces a bit, a little time to be a little healthy before we are completely wiped out. Much of the Nation's historical heritage is preserved in museums of Pennsylvania. We seem to be very long on Pennsylvanians today. This heritage is represented in the form of living collections, specimen trees and rare and endangered animals, works of art and priceless manuscripts and documents.

These repositories, in which I may add the Government has a considerable investment already, represent a national trust that must be passed on to future generations as they were passed to us. The general operating services provided by the Institute of Museum Services is critical for the preservation, and when I say preservation I mean just that without holding the lines of these collections. As Mr. Force has said, operating expenses are very unpopular with the corporations and the foundations. They are the oatmeal and they are not the dessert which those private large grants are interested in.

Last year IMS awarded \$726,455 to the museums of Pennsylvania of which \$417,282 was given to the support of Philadelphia museums. The proposed rescission of funding was stranded in the institutions and this is hardly the time to jeopardize the Institution's ability to adequately protect our priceless national heritage. We happen to have a great deal of it in Philadelphia because we started there before this lovely city was built.

This would be true, of course, not only in Philadelphia but all over the Nation and probably the hardest hit would be, as Mrs. Bonney said, the smaller institutions because they haven't got the resources to go out for moneys. Our cultural institutions have come a long, long way out of the dark ages where they were before the Govenment became involved and if we slip back now before we can regroup and find other sources it will be far more costly to come back like, say, Union Station, the Visitor Center, which it is going to take an awful lot to get that back.

Mr. REGULA. Don't remind us of that, Mrs. O'Neill.

Mrs. O'NEILL. I am sorry. I was hitting below the belt, I admit. You know, it is sort of like recovering an alcoholic who says it is a lot easier to stay sober than to get sober.

I would hope, as Hobart Rowen said, who is the financial writer for the Post, as everybody knows, truly America is still wealthy enough to help finance garden museums and public broadcasting

and still spare some for the arts and humanities. Our museums serve as a great backdrop for those things, a window for the outside world to look in, an attraction for foreign visitors. I think recently we have been able to be very proud of our cultural institutions. I am afraid when people visited us from other lands before, well, it was rather austere and not too stimulating. The collections of museums or the documentation of our cultural heritage we need to interpret to each new generation as each new generation comes along.

Museums are the fountainheads of informal education which have become such an important part of our lives. In recent years in the two organizations on whose boards I currently sit they have become an integral part of the educational enterprise, not simply a day out of school. We have many, many school children, school groups, educational groups in all of our museums in Philadelphia and they are part of our local education, and I am sure this is true all over the country and it enriches our national spirit as has been pointed out.

The average age of the population is becoming older all the time and the demand for museum programs is very much intensified in this field and it has been a rather neglected field up until now. IMS funding has helped expand audiences and link museums with the traditional educational establishment. The rescission of IMS funding would eliminate these problems at a time when the need has never been greater.

I pause to reflect I think in some parts of Government, present company certainly excepted, I detect a Government attitude that museums are dated. I feel quite the contrary. Museums serve persons who cannot otherwise afford to see much of beauty, be it art, flora or fauna. Actually, in Philadelphia we did a survey. More people attended museums and like institutions in Philadelphia than attended all the sports events combined last year, and Philadelphia has at last become a great sports center so that is quite a lot of attendances. I think it is a statistic that bears thinking about.

Finally, I would like to state that the Federal funding in the case of IMS has certainly not driven out the private dollar; quite the opposite, it has stimulated it. In my own case, and I believe this is true of many contributors to museums, I would like to give to an institution a clear idea of how it serves and where it is going. I spent a life time in fund raising and if I go to a prospect and I don't know what they are talking about or where we're going or what our program goal is, I am not likely to get very far.

IMS funding has given the institutions such as the Morris Arboretum and the Academy resources to develop long-range plans and IMS has had an enormously popular influence on all of these institutions in this and in many other ways on the strength of the institution's ability to raise private dollars. Eliminating funds that have already been appropriated for fiscal year 1981 would be damaging to say the least. Yale University's president put it very well, he said we will have been mugged.

In conclusion I would like to say that the protection and interpretation of the cultural heritage of this country is not just a matter of concern for the private sector, it is a national concern just as much as defense is and I don't begrudge national defense

one penny, we are in sore need of it there. Federal leadership in the support of museum programs is critical.

I would strongly urge the strengthening of the Federal private sector partnership. Again I would like to say I am strongly in favor putting the major part of the burden on the private sector. I am sick and tired of the attitude that the Government should do it. After all, who is the Government in a free enterprise system in a democracy such as ours? We are certainly the Government but I found the relatively small government funding that IMS has given us to be an enormous lever in raising funds.

It is a stamp of approval, as has been pointed out; it is a leadership gift, it enables the two museums on whose boards I currently sit and those others what I wish I had an intimate relationship with how to focus with a well coordinated set of programs and goals. The proof of the pudding is, for instance, that the inception of government support of cultural activities the growth of corporate giving increased from \$22 million in 1965 to \$435 million in 1979. That is quite an increase. I repeat, I know the cuts are necessary. We accept that but rescission we feel is too drastic and too fast, it is not equitable to other budget trims and the sum involved nationally is so minute to all but the museums involved.

Thank you.

TESTIMONY OF GEORGE RABB

Mr. REGULA. Thank you, Mrs. O'Neill.

Mr. Rabb, Director of the Chicago Zoological Park.

Mr. Rabb, your statement will be made a part of the record without objection and you may read it or summarize it as you choose.

[The statement follows:]

Statement of

Mr. George Rabb, Director
Chicago Zoological Park (Brookfield Zoo), Chicago, Illinois

Before the

Subcommittee on Interior and Related Agencies
of the

Appropriations Committee of the
House of Representatives

in Support of Appropriations for the

Institute of Museum Services

March 24, 1981

I am George Rabb, Director of Chicago's Brookfield Zoo. I am appearing also on behalf of fellow organizations in the American Association of Zoological Parks and Aquariums. I appreciate the opportunity to make a statement on the Institute of Museum Services before the Subcommittee on the Interior Department and Related Agencies of the House Appropriations Committee.

General operating support grants from Institute of Museum Services have been significant in the operations and development of numerous zoological parks and aquariums. The IMS funds have essentially been seed money enabling our institutions to originate public service programs and to become more self-sufficient.

For example, at Chicago's Brookfield Zoo such grants have enabled us to initiate and build up a docent program. These volunteer educators receive a rather thorough training course of 18 weeks duration. This training enables them to interact with school groups and the general public from a solid base of understanding the natural history of the animals. The docent corps of 80 serve one day a week each and provided special tours to 17,095 people in 1980, plus conducting over 200,000 people through our Predator Ecology exhibits, where the extremely naturalistic settings require skilled interpretation. The grants have helped cover the salaries of staff who train and coordinate the docents and who arrange visits from the 5,000 schools of metropolitan Chicago.

Downtown in Chicago the Lincoln Park Zoological Garden has used IMS grant funds to produce informative signs and labels and to initiate several educational programs that otherwise might

not have been. Director Lester Fisher estimates that 90% of the graphic signs in Lincoln Park now are a result of the IMS support.

At Cincinnati Zoo, IMS funds were employed to support marketing and advertising programs promoting membership, to start a development department to help bring in private contributions, and to start a zoo school curriculum.

At the Washington Park Zoo in Portland, an IMS grant supported production of a guide book, coordination of research activities, and an outreach program serving schools and nursing homes.

And so it goes across the country, at Seattle Aquarium, San Antonio Zoo, Philadelphia Zoo, Baltimore Zoo and also at smaller places such as the John Ball Zoo in Grand Rapids, the Santa Barbara Zoo, and the Miller Park Zoo in Bloomington, Illinois. For the latter the grants have helped improve staff training and competencies.

Among IMS special grants in 1980, that to the Minnesota State Zoo helped operate ISIS, which is the national clearing house for animal records. This computerized program is essential to the development of sound management plans for many species whose prospects of survival in the wild are becoming more doubtful every day.

Besides the specific purposes of individual institutions, the effects of the grants have been severalfold. The application process has become progressively more rigorous, causing examination of institutional objectives in relation to public services and definition of programs that otherwise might be poorly conceived

although well-intended. The competitive nature of the IMS grants has stimulated many institutions to analyze their operations and to invigorate financial support programs. For smaller institutions in particular, replacing IMS grants will be very difficult. That local revenue-sharing will extend to them is an uncertain prospect. For all institutions the leverage provided by IMS grants will be lost: private foundations, corporate sponsors, and individuals will no longer have the indication of worth and need that the IMS grants signified.

To have a context for these comments, one must realize that zoos and aquariums of the U.S. serve an enormous public: over 100 million visitors a year are recorded. The need for economical recreational and educational services such as zoos and aquariums provide is becoming more pronounced in these times of economic hardship, including more costly travel.

Collectively zoos and aquariums are also a national treasury. Their living animal collections are important as gene banks for the future. Many zoo professionals and conservation minded biologists recognize that the diminution of the diversity of life may be the most tragic circumstance of our era. Working to prevent extinctions of species or at least to diminish the rate at which we are losing the earth's irreplaceable diversity is a newfound and awesome responsibility. Clearly the dimensions of the task require much more support nationally than ever before.

Thus there is widespread disappointment and disillusionment among zoos and aquariums at the current administrative moves to do away with the relatively meager but important sources of federal support represented in the IMS granting programs.

Last Saturday evening I remarked on the hearings here today before an informal dinner assembly of fifty of our docents and their spouses. These people are of diverse ages, experiences, income levels, and political persuasions. Yet all were very concerned about the proposed reductions or elimination of the small but critical federal support of our cultural institutions.

We trust that the representatives of the people will think very carefully about the actions proposed by the administration in respect to priorities in the national welfare.

Mr. RABB. I will try to minimize the repetition of the previous panelists, most of whose remarks I agree with wholeheartedly. I am appearing not only on behalf of my own institution but also on behalf of fellow organizations in the American Association of Zoological Parks and Aquariums. I appreciate this opportunity to make a statement on the Institute of Museum Services.

General operating support grants from Institute of Museum Services have been significant in the operations and development of numerous zoological parks and aquariums. The IMS funds have essentially been seed money enabling our institutions to originate public service programs and to become more self-sufficient.

There are very few Federal programs that do provide for these institutions, especially with regard to general operating support. If I may, I would like to cite a few examples of the kinds of things that have been supported in this fashion. At our Brookfield Zoo we have established a decent program of volunteer educators who serve one day a week but only after they have gone through a rigorous 18 week prefatory program. Last year they served about 17,000 people on special tours plus conducting over 200,000 people through our Predator Ecology exhibits where the extremely naturalistic settings require skilled interpretation.

We could not afford to pay the staff for that but the grants have helped us pay for staff who have trained these people to coordinate their activities and so on. The success of this particular educational program has led to our launching a visitor education and orientation center and we are in the beginning processes for that. It has also enabled us to attract foundation grants for leaflets and supplementary materials.

Downtown in Chicago the Lincoln Park Zoological Garden has used IMS grant funds to produce informative signs and labels and to initiate several educational programs that otherwise might not have been. Director Lester Fisher estimates that 90 percent of the graphic signs in Lincoln Park now are a result of the IMS support.

At Cincinnati Zoo, IMS funds were employed to support marketing and advertising programs promoting membership, to start a development department to help bring in private contributions, and to start a zoo school curriculum.

And so it goes across the country at Seattle Aquarium, San Antonio Zoo, Philadelphia Zoo, Baltimore Zoo and also at smaller places such as the John Ball Zoo in Grand Rapids, the Santa Barbara Zoo and the Miller Park Zoo in Bloomington, Illinois. For the latter the grants have helped improve staff training and competencies.

Among IMS special grants in 1980, those that the Minnesota State Zoo helped operate ISIS, which is the national clearinghouse for animal records. This computerized program is essential to the development of sound management plans for many species whose prospects of survival in the wild are becoming more doubtful every day.

Besides the specific purposes of individual institutions, the effects of the grants have been severalfold. The application process itself has become more rigorous, causing examination of institutional objectives in relation to public services and definitions of programs that might otherwise be poorly conceived although well-inten-

tioned. The competitive nature of the IMS grants has stimulated many institutions to analyze their operations and to invigorate their financial support programs.

For smaller institutions in particular, replacing IMS grants will be very difficult. That local revenue-sharing will extend to them is an uncertain prospect. For all institutions that I have direct knowledge of, the leverage provided by IMS grants will be lost: private foundations, corporate sponsors and individuals will no longer have the indication of worth and need that the IMS grants have signified. That good housekeeping seal of approval simply won't be there.

To have a context for these comments, one must realize that zoos and aquariums of the United States serve an enormous public and certainly not an uninterested one as our previous analysts have commented. Over 100 million visitors a year are recorded in our 200 zoos and aquariums. The need for economical recreational and educational services such as zoos and aquariums provide is becoming more pronounced in these times of economic hardship, including of course more costly travel.

Collectively zoos and aquariums are also a national treasury. Their living animal collections are important as gene banks for the future. Many zoo professionals and conservation minded biologists recognize that the diminution of the diversity of life may be the most tragic circumstance of our era. Working to prevent extinctions of species or at least to diminish the rate at which we are losing the earth's irreplaceable diversity is a newfound and awesome responsibility. Clearly the dimensions of the task require much more support nationally than ever before.

Thus there is understandably widespread disappointment and disillusionment among zoos and aquariums at the current administrative moves to do away with the relatively meager but important sources of federal support represented in the IMS granting programs.

Last Saturday evening I remarked on the hearings here today before an informal dinner assembly of 50 of our docents and their spouses. These people are of diverse ages, experiences, income levels and political persuasions yet all were very concerned indeed about the proposed reductions or elimination of the small but critical Federal support of our cultural institutions.

We trust that the representatives of the people will think very carefully about the actions proposed by the administration in respect to priorities in the national welfare.

Thank you.

Mr. YATES. Thank you.

Ms. Stewart.

TESTIMONY OF ROWENA STEWART

Ms. STEWART. It is ironic that I should be sitting in front of this crumbled paper in that I as president of the African-American Museums Association and director of a Black Historical Society in Providence, Rhode Island represent a small group of historical societies in the art museums across this country, about 100 of us who are seeking to preserve the past and realizing full well that much of our collection rests within the museums and because our history is not a priority in those museums we will be allowed to crumble if funds such as IMS are not received.

It is an honor for me, Mr. Chairman, to appear here today and to make a plea for the right to the life of an institution that is valuable to the survival of all of the museum communities, 7,500 of us across America and certainly in the case of the African-American museums 100 that really could be termed as sudden infant death because much of their support is going to depend on the support we get from agencies for our general operating funds. To be forthright, I must confess that my testimony this afternoon is as much a plea to save IMS as it is a statement on the potential source of support for our agencies. You must admit that in three years of IMS being in existence, we have received only \$176,000 for all of our museums across the country, about 80 of our museums to be exact.

Yet IMS was established after extensive and intense surveys of the needs of the museum community by the American Association of Museums. We feel that it is a baby well conceived.

We are dealing with the right of birth for IMS. IMS we are interpreting as a fetus—four years of life represented in only four years of its existence as a fetus. At that time only the large traditional museums, primed by their established proposal development offices, were able to receive the sizable moneys that were available. I must admit we, too, had some well-developed museums across the country and three of our museums received funding; namely, Dusabo in Chicago, National Center for Afro-American Art in Boston and the Museum of African-American History in Detroit.

In the second year small museums protested and you heard our screams across the country, and IMS readjusted its position and most of us became again this time a part of their process. We served on panels. We began to learn then how that whole process was developing and it seems almost every time you learn how the system works, someone comes along and dissolves it. At that point Detroit, the Bethune Archives and the Sholemborg collection received some funds.

Now it is important to me that we realize that the institutions that are receiving the funds are located in the large cities, serving large populations, and some of them are of national concern. Certainly the Sholemborg collection is a national concern. Certain of the Bethune Archives is a national concern. Bethune Archives received funds in order to develop its fund raising capacities and this will in turn enable them to become self-sufficient and, after all, that is the desire of most of our museums.

During the third year of IMS, black museums in particular had begun to understand the process and more and more of our museums saw a lifeline that IMS represented or threw out to them. As a result of that in its fourth year, the IMS and the African-American Museums Association began to realize that we were at a crucial point. In fact, we were now or could be considered as an expectant mother would be considered needing some diet supplements. As a result of that the African-American Museums Association in its Script—and I would like to enter this, Mr. Chairman, as part of the record.

Mr. YATES. That may be included in the record.

[The information follows:]

AFRICAN
AMERICAN
MUSEUMS
ASSOCIATION

SCRIP

VOLUME 1, NUMBER 1

FALL 1980

Institute of Museum Services: The Most Valuable Grant a Museum Can Receive

The Institute of Museum Services can provide your museum with vital operational support. If you need to employ a curator, purchase office or museum supplies; hire a part-time typist or accountant, publish pamphlets on your museum programs or collections, pay employee benefits and legal expenses, maintain and repair your building or the objects in your collection, join an organization which will provide you services or procure consultant services, the Institute of Museum Services can help you.

Lee Kimche, Director of the Department of Education's Institute of Museum Services, in her recent announcement of fiscal year 1980's grants, said, "General Operating Support Grants are the most valuable type a museum can receive because they are applied towards the basic services that museums can provide education, conservation, security, exhibitions, and outreach programs — while allowing local museums to establish their own priorities."

In March of 1981 you can submit an application for general operating support to IMS. It would be advisable to get a grant application and information booklet as soon as possible from Mr. Tom Litkowski, Program Officer, IMS, U.S. Office of Education, 7th and D Streets, S.W., Washington, D.C. 20202, telephone number 202-245-8817, so that you can carefully assess the requirements of the application in light of your own operational needs for October 1981-September 1982.

The grant can only be 30% of your institution's budget and should reflect only reasonable increases from your budget of the two previous years unless you can indicate where you will receive additional funds for a greatly increased program thrust. However IMS has received requests from museums and made grants available to museums that have been static for a number of years after incorporation. If you are now revitalizing yours and in a similar position, account for the time and indicate the reasons why clearly (lack of finances or help, time spent in museum

(Continued on Col. 2)



Milton Williams

President Carter signing the Boston National Historic Site Bill on October 10. Byron Rushing, Director of the Museum of Afro-American History in Boston is at left. Executive Director, Joy Austin, is next to him. Also in the picture are Coretta Scott King and her son, Guy McElroy of the Bethune Museum and J. Rupert Picott.

planning) and then go on to detail what your future programming and your long range plans will be. Make a strong statement showing how vital your program is to the education and enjoyment of your community. Be concrete and specific about the planned program.

Organizational Structure

In addition to outlining staff responsibility it is important to consider your Board of Trustees. You will need to define their responsibility. Do they meet monthly with staff to review activities and budget, decide on museum policy, act on proposals presented by you? Are they divided into committees, that maintain property, give legal advice, work on publications, acquisitions and public relations? Are they actively involved in the research work of the museum? Do they act as volunteers? Who do they represent? What expertise do they bring? This is important for a small museum to consider because in many cases who the directors are and the volunteer work they do are the main criteria for establishing the credibility of the museum.

Curatorial Activities

If your activities have been limited say how and why and then go on to point out what you have done and give your plans for the coming

(Continued on Col. 3)

year.

Community Commitment

You will need to show volunteer resources of your organization. Docent service receptionist duties, hostesses for special occasions, activities of the board should all be noted.

(See IMS, Page 2, Col. 1)

"For while the tale of how we suffer, and how we are delighted, and how we may triumph is never new, it always must be heard, there isn't any other tale to tell, it's the only light we have in all of this darkness."

—James Baldwin

Why Join the AAMA

The AAMA President for 1980-81 — Rowena Stewart, Director of the Rhode Island Black Heritage Society:

The African-American Museums Association is the national body of institutions whose mission is to collect, preserve and celebrate the African-American history and culture. As a non-profit institution, its work is to advocate on behalf of the museums, historical societies and museums-type organizations at a national and international level.

(See JOIN AAMA, Page 2, Col. 2)

Scrip: (Rogel's Thesaurus) written matter, documents, token, label, memento, currency: All important to Museums.
The publication of this Newsletter is made possible by a grant from the Smithsonian Institution under the National Museum Act.

IMS

(Continued from Page 1, Col. 3)

Describe the financial support of your community. IMS guidelines really emphasize the need to show that you have a position in the community and that it responds to you.

IMS Grant

Show specifically what it will do and what aspect of the museum's activities it will finance. Show how your other funds are used for your program and operational support and relate IMS funds to that.

Long Range Plans

Show how you will improve your program's financial base in the next five to ten years. Do not project plans for self-sufficiency that you cannot reasonably display evidence you will be able to reach.

Be specific. Be clear. Describe your philosophy, your mission as a museum and your program within the context of the IMS funds you require as well as your past and future finances. Document your community support and your Board of Trustees' activities. Send it in carefully edited and proofed and on time.

Two black institutions who received grants from IMS this year were the Great Plains Black Museum of Omaha, Nebraska, \$20,337 for general operating support and the Bethune Museum in Washington, D.C., \$35,000 for special project support.



Energy Boosts

If your energy bills are competing with your programming for top priority, there are several things you can do. One, could be to sit down and devise ways to save energy that do not require expensive computers but demonstrate on a small scale, energy efficient concepts and projects. Regional energy offices can accept and fund grant proposals and grants ranging from a few hundred dollars to \$30,000.

The regional and state offices can also give you information about additional sources of funding and technical assistance.

If you prefer to use an energy program already established, the New Manual *Energy Management for Museums and Historical Societies*, edited by Dr. Robert Mattai, it gives complete information on a number of subjects including:

- how to make an energy audit
- energy conservation techniques
- sources of funding and technical assistance
- how to protect collections and facilities

(Continued on Col. 2)

Join AAMA

(Continued from Page 1, Col. 2)

Black museums have grown at a phenomenal rate since the first ones came out of the civil rights movement. They were an answer to the questions who, if not we, will make sure that the impact of our contributions from the very beginning of this nation, is perpetually preserved for the benefit of our own generations to come and for the enlightenment of the larger community; who, if not we, will make sure that the work, the heroes, the heroines, the extraordinary lives of our people who built communities and industries in every region of this nation and continue to do so is documented with material object and written record; who, if not we, will celebrate the cultural creativity of the black men and women by providing the space for continually telling the stories and singing the songs and making new ones in the land.

The African-American Museums Association is committed to supporting the mission and work of the museums on the national level and will vigorously serve them in new ways. The association will:

1. Provide linkage and networking facilities for African-American museums.
2. Act as a crisis intervention agency to help museums move out of temporary difficult situations.
3. Be a resource center for information about funding sources and technical assistance.
4. Maintain on-going surveys and research on African-American museums and the history, art and science disciplines they are part of.
5. Have a consultant service for museums and other institutions requiring those services.
6. Provide training in managerial and museum skills to enhance professional standards of African-American museums.
7. Lead the initiatives for changing established trends in museums.
8. Convene annual and quarterly meetings of museums.

We can help you make your institutions strong and successful so that we can tell our strong story always, everywhere. Join us today. With your membership, we can all move ahead.

during energy emergencies.

The *Energy Manual* can be purchased for \$6.00 per copy plus \$1.00 for postage and handling. Bulk rates are available. Call 212-699-9152 or write the Energy Information Clearinghouse, New York Hall of Science, Box 1032, Flushing, New York 11352 for the manual and a list of regional offices.

If you are planning to build, restore or

National Black Museums Conference in Chicago

African-American Museums Association is cooperating with the Bethune Historical Development Project in holding a conference on Black Museums: Interpreting the Humanities. The conference, sponsored by the National Endowment for the Humanities will be held on November 20-22 at the Hyde Park Hotel in Chicago, Illinois. The Dusable Museum, a member institution, will serve as the host institution and a distinguished group of museum professionals, including AAMA members, historians and humanists will participate in conference sessions. National Endowment Chairman, Joseph Duffey, will speak at the opening session.

The first day of the conference will look at the problems and perspectives that museums must consider when they interpret the Black experience in film, photography, performing and visual arts, archival records and oral tradition.

During the second day of the conference panelists will consider questions and issues of importance to the structural and programmatic development of black museums, historical organizations and institutions with museum functions. Some topics to be discussed will be restoration and archaeological efforts at defining the black past, black museums and the national black community and problems of starting a black museum and continuing to manage and finance it, as well as developing historical black collections and using public and private sources for exhibitions.

Dr. Margaret Burroughs, AAMA Councilor and pioneer in the museum effort will present a luncheon address where she will look at the black museum movement thus far and make predictions for the future of a healthy and strong group of museums. Rowena Stewart, AAMA President, will introduce that session.

AAMA participants will include in addition to Dr. Burroughs and Mrs. Stewart, Dr. Bettye Thomas, Ben Hazard, John Kinard, Byron Rushing, Barry Gailther, Thomas Battle, Leo Twigg, John Harmon, Marjorie Anderson, Guy McElroy, Roslyn Walker, Alonzo Jennings, Dr. Charles Wright and Lowery Sims.

Dr. Bettye Thomas, AAMA's first Vice-President has put the entire conference program together and coordinated all logistics for the conference. We are all looking forward to the information sharing and learning that will come out of the conference.

renovate a museum, you should contact the Design Arts Program of the National Endowment for the Arts which will support plans that include energy-conscious designs. Write Charles Zucker, Design Arts Program, National Endowment for the Arts, Washington, D.C. 20506. Future issues of the newsletter will carry information about energy programs and technology.

Culture Experiences

ES020 The Afro-American Museum of Detroit is busy raising funds for their new building. On Saturday, September 27th, they held a very successful art auction and raised \$5,000 from the sale of art works donated by well-known black artists of the Detroit area: Carl Owens and James Lewis, two well-known artists with a national reputation and others like Yusuf Rasheed, Ron Scarborough, Charles McGee and Carissa Johns.

As a part of a continuing effort to make the community responsive to their fund-raising efforts for the new building, the museum will open an exhibition on November 4, 1980, by Artist-Curator-in-Residence James Lewis of 38 paintings depicting the bricks which will be used to build the museum.

The museum will co-sponsor with several black insurance companies an exhibition on the history of insurance and will present an exhibition on black athletes with the support of American Airlines. Both exhibitions are scheduled for late 1980 and early 1981.

Docents in African and African-American museums would be well advised to read a slim new book, "A Guide to African and African-American Art" prepared by Molefi Asante and Kariamu Welsh for students and teachers. Beautifully designed and with representative photographs of African art presented in exquisite taste, the book is a wonderful introduction to African art and the ethnic diversity in Africa. The book is published by the Museum of African and African-American Art and Antiquities, Buffalo, New York and is distributed by them (Museum of African and African-American Art and Antiquities, 11 East Utica Street, Buffalo, New York 14209).

Africa semper aliquid novi (there is always something new out of Africa). This quote by Pliny the Elder, A.D. 23-79 in his natural history is taken from the catalogue to the exhibition, *Out of Africa*, from West African Kingdoms to Colonization currently at the Anacostia Museum in Washington, D.C.

The story of Africans and Afro-Americans, the important exhibition looks at West African beginnings, the slave trade and system in the West Indies and America, slave revolts in these two areas and the various antislavery, abolitionist and colonization movements. It is difficult to single out any one aspect of the exhibition that is more informative, more poignant, more significant than another, but the exhibit on the colonization of Liberia brought out in one viewer's eyes that this was one of the most serious and decisive steps taken by African-Americans. Be sure to see it if you're in Washington.

The Afro-American Cultural Foundation with John Harmon, AAMA Councilor as its executive director was instrumental in arranging a re-enactment of an important point in the history of the American Revolution, on

September 21 in Croton-On-Hudson, N.Y. The New York Times described it thus: "A turning point in the American Revolution and a moment of pride for this region's small black community was re-enacted here today, when Caleb Peterson of Peekskill fired a three-pound cannon to signal the beginning of the end of Benedict Arnold's treasonous plot."

Peterson is the descendant of Jacob Peterson, a black American militiaman who fired on the British warship 200 years ago. That led to the capture of the British spy, Major Andre, who had in his possession plans for West Point given him by Major Benedict Arnold.

John Harmon, who is currently writing a history of the region's early black community, said, "This historical event is a recognition of persons normally not given credit for their role in bringing the Revolution to success."



Stanback Museum/ Planetarium

At South Carolina State College, the I. P. Stanback Museum/Planetarium, a 16,000 sq. ft. contemporary structure located near the center of the campus, includes a 45 x 65 ft. main gallery, a smaller permanent collection gallery, a sculpture court and studios for printmaking, ceramics and sculpture. A unique modular exhibit design system is employed in the galleries allowing for an infinite number of exhibit design variations. The new buildings were dedicated in April of this year.

The 40 ft. dome planetarium, which seats eighty-two people, is located directly across the lobby from the museum. Its Viewlex star projector and multiple slide presentation system provides the capability of integrating museum and planetarium programming for a variety of unique multi-media presentations.

The museum is open from 9:00 a.m. to 4:30 p.m. daily. Week-end scheduling and special openings will be announced.

Dr. Leo Twiggs, AAMA Southeast Councilor, is Director of the Museum.

The Museum's 1980/81 Calendar lists a full year of exhibitions. Highlights of events at the Museum will include a pictorial Biography of Dr. Benjamin E. Mays; in November, an exhibition of photographs of Black history of the Charleston district. In December and February a major exhibition of 75 prints by Afro-American artists selected by Harriet Kennedy and Benjamin Peterson of the National Center of Afro-American Artists, will be displayed.

It's The Law

President Carter signed into Law the bill to provide for the establishment of the Boston African American National Historic Site in the Commonwealth of Massachusetts on October 10th. Members of the AAMA had supported the bill with Byron Rushing, Director of the Museum of Afro-American History in Boston, being the chief supporter. The museum of Afro-American History which currently provides tours of the Black Heritage Trail on Beacon Hill (the site of an important nineteenth century black community) is renovating the African Meeting House, the oldest extant Black church in the nation. Representative Moakley of Massachusetts first introduced the bill into Congress and it was supported by Senator Tsongas in the Senate. The bill to establish the National Center for the Study of Afro American History and Culture at Wilberforce in Ohio was amended to the Boston National Historic Site Bill and also made law.

John Fleming, the new director of the Wilberforce Project will meet with members in Chicago to inform us of latest developments and an overview of the history of the project.



I. P. Stanback Museum/Planetarium.

Opportunities for Education

The Cultural Institutions Management Program is sponsored by Museums Collaborative Inc., with the faculty from the Columbia University Graduate School of Business, and intended for middle and executive level personnel from museums, zoos, botanical gardens, historical societies and related service organizations. The 3 institutes in the 1980-81 program are all designed to develop management skills of individuals who are in positions to improve the operations of cultural institutions.

Courses center around the topics of Marketing Research/Audience Development, Principles of Management for Cultural Institutions and Human Resources Management. Partial fellowships are available. For further information write, Andrea E. Glauz, Director, Continuing Professional Education Program, Museums Collaborative, Inc., 15 Gramercy Park South, New York, New York, 10003. (Tel. No. 212 674-0030).

Smithsonian Institute Workshops Series

The program with seminars lasting from two to four days is designed to introduce and improve professional skills for individuals in museums. There is no charge for the seminars, but enrollment is limited. For complete information write: Workshop Series, Office of Museum Programs, Arts and Industries Building, Room 2235, Washington, D.C. 20560.

Upcoming seminars include:

December 8-12, 1980

Fundamentals of Museum Management
January 8-9, 1981

The Words You Exhibit

January 12-16, 1981

Museum Registration Methods

January 19-21, 1981

Museum School Relations

January 28-30, 1981

Budgeting and Basic Accounting

Museum Management Institute

1981 MMI, an intensive management training program for museum professionals developed by Western Association of Art Management and University Extension — University of California, Berkeley, announces its January deadline for applications. The four week residential session will be held July 13-August 8 on Berkeley campus. Funded in part by NEA, the Institute aims to:

1. promote better understanding of management concepts/business principles as they apply to museum fields
2. enable participants to broaden their knowledge of their profession; to have an interchange of ideas and experiences with colleagues from other museums

Detailed information on MMI can be obtained from P. McDonnell
Training Coordinator
Western Association of Art Museums
270 Sutter St.
San Francisco, California 94108
Tel. No. 415 392-9222

National Science Foundation Minority Graduate Fellowships For 1981-1982

The National Research Council will again advise the National Science Foundation in the selection of candidates for the Foundation's program of Minority Graduate Fellowships. Panels of eminent scientists and engineers appointed by the National Research Council will evaluate qualifications of applicants. Final selection of Fellows will be made by the Foundation, with awards to be announced in March 1981.

The NSF Minority Graduate Fellowship Program is open only to persons who are citizens or nationals of the United States at the time of application, and who are members of an ethnic minority group underrepresented in the advanced levels of the Nation's science talent pool — i.e., American Indian, Alaskan Native (Eskimo or Aleut), Black, Mexican American/Chicano, or Puerto Rican.

Eligibility is limited to those individuals who, at the time of application have not

completed more than 20 semester hours/30 quarter hours, or equivalent, of study in any of the science fields listed below following completion of their first baccalaureate degree in science. Subject to the availability of funds, new fellowships awarded in the Spring of 1981 will be for periods of three years, the second and third years contingent on certification to the Foundation by the fellowship institutions of the student's satisfactory progress toward an advanced degree in science.

These fellowships will be awarded for study or work leading to master's or doctoral degrees in the mathematical, physical, biological, engineering, and social sciences, and in the history and philosophy of science.

The annual stipend for Minority Graduate Fellows will be \$4,800 for a twelve-month tenure.

The deadline date for the submission of applications for NSF Minority Graduate Fellowships is November 26, 1980. Further information and application materials may be obtained from the Fellowship Office, National Research Council, 2101 Constitution Avenue, Washington, D.C. 20418.

Are You Available?

Audiovisual Program Coordinator American Association for State and Local History. Must be able to write clearly and concisely/ effectively edit written scripts and sets of photographic slides; understand good photographic composition; operate a 35mm lens reflex camera; communicate effectively by phone; supervise others and understand the functions of historical agencies. Bachelor's degree in art or history or a related field; preferred with a master's—\$1065 per month depending on qualifications. One year position under a federal grant.* Person must relocate to Nashville. Send letter and application to George Rollie Adams, Director Education Division AASLH, 1400 Eighth Avenue South, Nashville, Tennessee, 37203.
* Starting date on or soon after November 1st.

Associate Curator Providence Crandall Archives and Historical Society, Canterbury, Connecticut. Must have a knowledge of American history, as it relates to social,

cultural and technological trends in museums collections, 5 years experience with presentation, exhibition and research functions or a Bachelor's degree and one year's experience; have ability in written and oral expression and work with staff, colleagues and public. Salary \$13,636-\$16,534, depending on experience. Will be a state employee. This Archives and Historical Society has Black heritage ties. Send application and resume to Marion K. Leonard, Museum Director, State of Connecticut Historical Commission, 59 South Prospect Street, Hartford, Connecticut 06106.

Connecticut Careers Trainee will receive on the job training for a technical, professional or administrative position in a State agency after one year. Should possess a Bachelor's or Master's degree. (Candidates for a Bachelor's degree may be accepted but permanent appointment is subject to receipt of degree). Salary is from \$11,850-\$14,496. Send application and resume to Marion K. Leonard, Museum Director, State of Connecticut Historical Commission, 59 South Prospect St., Hartford, Connecticut 06106.

Black History Museums To Be Featured In History News

The February 1981 edition of **History News** will focus on African-American Museums, historical societies and preservation, restoration and collection efforts in these. Please submit information about your museum's activities in February and the upcoming months to Betty Doak Elder, Editor, History News, by December 1.

History News in February must reflect the Black experience in this country. You can

help by submitting information for the section, **What's Going On** which focuses on new grant prospects, meetings, seminars and conferences, Special Events, Educational Opportunities, New in History, Publications, Exhibits, Et Cetera.

Send AAMA offices this information at the same time for the January newsletter.

The full address is:

Betty Doak Elder, Editor,
History News,
American Association for State & Local History,
1400 Eighth Avenue South
Nashville, Tennessee 37203

Service Available

SCRIP can serve you by providing the following information:

1. Profiles on funding services, both public and private and a funding calendar.
2. Technical assistance in successful grantsmanship, especially that prepared by the various funding agencies.
3. Technical assistance in the form of tips and short articles on such subjects as mem-

bership campaigns, public relations, interpreting collections and developing new ones from the community in which you work, collection sharing, and other subjects which you deem necessary.

4. Information about members, professional profiles, upcoming exhibits and conferences; programs and publications of member institutions. Please send us these now.

5. Information about service organizations' activities, workshops, internships, conventions.

6. Legislation and regulation that relates to our Association.

7. Listing of job placement for institutions and individuals.

8. A special section for archivists and researchers which will seek answers to the questions: Do you have it or know where it is? Can you help?

9. AAMA executive office news.

Please give your first impression of the Newsletter and suggestions for improvement. Please use the newsletter to share information.

The National Association of Negro Business and Professional Women, Inc., is preparing a grant proposal to present an exhibition of the history of black women in business in seven cities (San Francisco, Detroit, Philadelphia, New York, Baltimore, Richmond and Atlanta), during the years 1830-1930. They would appreciate letters from members of AAMA and other museum personnel, stating that they endorse the project and indicating that they would be interested in having it come to their city in the future. The Association also requests that if you have or are aware of any research on black business women during that period, you send it to them.

Please respond as soon as possible to: 1808 New Hampshire Avenue, N.W., Washington, D.C. 20037.

For additional information contact:

Ms. E. J. Montgomery
WHMM TV - 32
2600 - 4th Street, N.W.
Washington, D.C. 20059

202/636-6090 or 636-5600

Needs Assessment Survey

Please check off in order of priority, those programs you feel will be most helpful to you in the coming year.

Training

- ☐ Management Techniques
- ☐ Museum Specialization Workshops (Interpretation, Collection, etc.)
- ☐ Tapping Community Resources — Financial and Voluntary Service
- ☐ Introduction to Archival Techniques
- ☐ Grantsmanship

Research

- ☐ Availability of Consultants
- ☐ Pamphlets on fund raising, Community Resources, etc.
- ☐ Data on Museums (their collections, Boards of Trustees, Programs, etc.)
- ☐ Resource book of scholars, museum specialists

Resources

- ☐ Establishment of Emergency Fund for Museums
- ☐ Financial aid to attend meetings and conferences
- ☐ Access to traveling Exhibitions and educational aids for use in your museum
- ☐ Availability of Consultants



Yoruba Sculpture (Ancestral figures)

Collection Museum of African Art and Antiquities, Buffalo, N.Y. Credit: FAFANA

Individual Membership Application Form

Mail this form today.

NAME _____

ADDRESS _____

CITY, STATE, ZIP _____

DUES \$25.00 — Includes Membership Card and Voting Privileges

Institutional Membership Application Form

INSTITUTION _____

ADDRESS _____

CITY, STATE, ZIP _____

BUDGET _____

BUDGET MEMBERSHIP DUES: Up to \$25,000—2 memberships - \$45.00 Dues; \$25,000 to \$150,000—4 memberships—\$90.00 Dues; Over \$150,000—6 memberships - \$135.00 Dues.

Funding Calendar

DECEMBER

*1st NEA
Challenge Grants (Notice of Intent)
Higher Education/Individual
Institution/Consultant
Youth Projects
Preliminary Proposal
* NMA
Special Studies and Research
Conservation and Museum
Technique
Professional Assistance in
Conservation and Museum
Practices
NEA
Expansion Arts Program
Visual Arts
19th NEA
Visual Arts

JANUARY

2nd NEA
Visual Arts
*15th NEH
Museums and
Historical
Organization
Projects
Youth Projects
formal application
NEH
Visual Arts

FEBRUARY

*1st NHPRC
NEH
Advanced Study
Fellowships
2nd NEA
Visual Arts
*15th NEH
Research Conferences

MARCH

*1st IMS
NEH
State/Local/Regional
Research
*30th NEA
Wider Availability of
Museums
Cooperative Museum
Programs
Special Exhibitions

* Of particular relevance to Museums

African-American
Museums Association
1318 Vermont Avenue, N.W.
Washington, D.C. 20005

Ms. STEWART. Our fall of 1980 issue indicated that the Institute of Museum Services was the most valuable grant a museum can receive.

Now we have at the same time, realizing that we needed to have funding, we needed to develop fund-raising techniques, in order that we may compete with the institutions that are most established in this country, develop a new need, that was an across the country need, an energy need, and IMS funding would enable some of our museums to pay their heat bills, their electrical bills, our guards and curators.

Now to abort this process is to deny life to hundreds of small history, science and art museums across the country and stunt the growth of many of those who represent the American people and provide for a most diverse picture of our American life and culture.

Now we are faced with a dilemma. Do we call the garbage collector or do we call the funeral director?

Mr. YATES. I lost you. What was your question?

Ms. STEWART. Do we call the garbage collector or do we call the funeral director? If we throw them out, we throw out the wealth of the Nation, the institutions that ensure that we survive in eternity. We are asking that you give us nine years just as you would give a full term pregnancy. Bring the baby to full term but give us that time and then let the Government review the process of birth out of the undoubtable pains of this process and judge its right to life then. Mr. Chairman, if you can persuade the Congress to save IMS, then you, too, can save the museum community for this country.

Mr. YATES. Thank you very much.

Your statement will be made a part of the record.

[The statement follows:]

REMARKS OF

Ms. Rowena Stewart, President
African-American Museums Association, Washington, D.C.
Director, Rhode Island Black Historical Society
Providence, Rhode Island

Before the
Subcommittee on Interior and Related Agencies
of the

Appropriations Committee of the
House of Representatives
in support of Appropriations for the
Institute of Museum Services

March 24, 1981

Mr. Chairman,

It is indeed an honor for me to appear here today to make a plea for the right to the life of an institution, valuable to the survival of 7,500 museums in America and, in the case of the 100 black museums that I represent, it will mean sudden infant death. To be forthright, I must confess that my testimony this afternoon is as much a plea to save IMS as it is a statement on the potential source of support that IMS could be for black museums.

Yet, IMS was established after extensive and intense surveys of the needs of the museum community by the American Association of Museums. The baby was well-conceived.

We are dealing with the rite of birth for IMS. IMS is a mere fetus--four years of life represents only four months in existence of a fetus. Four years ago, the IMS was funded to provide operating support for museums. At that time, only the large traditional museums, primed by their established proposal development offices received sizeable monies from the IMS.

In the second year, small museums all over the country protested and from our primal screams, the IMS readjusted its position and more of us became part of the process.

During the third year of the IMS, black museums in particular had begun to understand the process and more and more museums saw the lifeline that IMS threw out to them. In the fourth year, the IMS and the museums for whom it provides support stand at the point that expectant mothers often find themselves. Needing diet supplements if the baby is to be healthy.

Now, we have at the same time that we need a diet of funding we need energy. Energy needs have become second to fund-raising. The question is: Does IMS have the right to live beyond the fourth year?

To abort it is to deny life to hundreds of small history, science and

art museums, and to stunt the growth of many others who present to the American people the whole complete diverse picture of American life and culture.

Do we call the garbageman or the funeral director? If we throw them out, we will throw out the wealth of this nation, the institutions that ensure that we survive in perpetuity.

Give us nine years. Bring the baby to full term. But give us that time. Then let government review the process of birth and out of the undoubtable pain of this process, judge its right to life then. Mr. Chairman, if you can persuade the Congress to save IMS you will save the museum community in this country.

STATEMENT OF MS. ROWENA STEWART, PRESIDENT,
AFRICAN AMERICAN MUSEUMS ASSOCIATION, WASHINGTON, D.C.
AND DIRECTOR, RHODE ISLAND BLACK HERITAGE SOCIETY, PROVIDENCE,
RHODE ISLAND

BEFORE THE SUBCOMMITTEE ON INTERIOR AND RELATED AGENCIES OF THE
APPROPRIATIONS COMMITTEE OF THE HOUSE OF REPRESENTATIVES IN
SUPPORT OF APPROPRIATIONS FOR THE INSTITUTE OF MUSEUM SERVICES.

MARCH 24 1981

The African American Museums Association represents almost one hundred museums. Like the institutions themselves, the Association is very young, two years old. However, during that time we have created a committed network of museums and established ourselves as the service organization most concerned with helping these museums receive adequate financial assistance and technical expertise so they become and remain strong professional institutions.

The museums have the high and specific purpose of collecting, preserving, and celebrating African American history, art and culture and ensuring this culture its rightful place in America's heritage. They are located in twenty-eight states; in all of the large major cities, Washington, New York, Chicago, San Francisco, Detroit, Boston, and in smaller communities as well, Orangeburg, S.C., Xenia, Ohio, and Wichita, Kansas. Many were started in the Civil Rights movement of the fifties and sixties, others were founded as a result of the impetus provided by the Bicentennial Celebration. However concern by Black Americans for preserving and interpreting their history goes back to the late 19th century: the travelling expositions of black American history and contributions, the founding of colleges for blacks where collecting by faculty and donations by the black community of arts and artifacts were standard procedure.

Today, black museums range in size from very small operations of less than \$5,000 to ones, (a very small number) with annual budgets of over \$500,000. None of them have established

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None of them have established endowments and all depend on community, state and federal support for implementation of their programs and the outreach that sharing their collections demands. This means that the steady operating support that IMS offered in the last three years has not generally been available to them. Grants from the Institute by stabilizing the operating budgets of many black museums and encouraging private monies could be a life force to them. Since many of them have small budgets, the IMS monies could make a difference.

To be forthright, I must confess that my testimony this afternoon is as much a plea to save IMS as it is a statement on the potential support that IMS could be for black museums. During its three years of existence, the Institute has funded 8 black museums, one of them twice, to the total of \$174,499. That represent 8/10 of one percent of the 21.5 million dollars that have gone to provide general operating or special project

MUSEUMS SUPPORTED BY IMSGeneral Operating Support 1978

Du Sable Museum of Afro American History Chicago, Illinois	\$25,000
Museum, National Center of Afro American Art Boston, Massachusetts	\$25,000
Museum of African American Life and Culture Dallas, Texas	\$ 5,000

General Operating Support 1979

Afro-American Museum of Detroit	\$23,400
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Special Projects 1979

Bethune Memorial Museum and Archives Washington, D.C.	\$20,262
Schomburg Center for Research in Black Culture New York, New York	\$ 8,500

General Operating Support 1980

Great Plains Black Museum Omaha, Nebraska	\$20,337
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Special Projects 1980

Bethune Memorial Museum and Archives Washington D.C.	\$35,000
Kumba Learning Center, Washington, D.C.	\$25,000

The above museums, funded by IMS, have used their monies for the purchase of office equipment, typewriters, fireproof cabinets, copying machines, to mount fund-raising and development programs, to rent trailers for a mobile museum to visit schools. The last two areas are areas particularly promoted by IMS.

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In the very first issue of the AAMA newsletter, published Winter of 1980, the lead article is entitled, "Institute of Museum Services, The Most Valuable Grant A Museum Can Receive." You see, we recognize the importance that IMS grants could have to the success or failure of black museums in the future and so we encourage our members to apply, to make sure that they all know and understood that IMS grants could become reliable means of financial support in themselves to these developing institutions and could act as incentives to raise funds from other sources.

At the same time, we notified IMS officials that we were concerned about the levels of funding of the black museum community because museums in this community most needed the resources of IMS.

AAMS has collaborated with the American Association of Museums in promoting the merits of the Museum Assessment Program, recognizing that this program could provide our members with needed professional expertise. Four of the first 200 museums earmarked to benefit from that program are black museums.

Mr. Chairman, we firmly believe in the black museum community, that IMS has the potential to help our developing museums sustain themselves on an even, steadily progressive footing.

In addition to the financial benefits, the support for a black museum by the Institute has a symbolic interpretation. The Institute is the only federal agency whose basic mission is to assist museums of all types with general operating support. It has also established specific guidelines for museums to be eligible for IMS grants. The black museum that applies and receives funds from IMS therefore also receives a stamp of

approval, a mark of its legitimacy a recognition of its own importance and the worthiness of the discipline it serves.

That is no small achievement for a black museum as it struggles for financial security as well as acceptance with the profession.

The Institute of Museum Services can be an impetus for growth, stability and accreditation for the black museum. That to this community is reason for its existence. But black museums, like all museums in this country, are repositories of a proud, rich dynamic heritage, second to none in the history of man and as institutions, none can be allowed to fail. The continued presence of the Institute of Museum Services can ensure a firm foundation for many museums, for many years and for generations to come.

Mr. YATES. What happens after nine years, are you on your own then?

Ms. STEWART. Yes.

Mr. YATES. You just want nine years?

Ms. STEWART. I feel firmly that the museums after nine years, we can prove our own worth in this country. I think that if museums can be aided, the developing of fund raising capabilities certainly for us, we have only been in existence for 25 years but there are lots of things out there that tell us the things to do and the things not to do. We need only an opportunity to develop our fund-raising techniques. You know, you cannot get corporate dollars unless you know how to get corporate dollars. You cannot save a collection if you are losing it as fast as you are collecting. Ninety percent of our collections are coming out of the attics, out of the bureau drawers, out of the basements of people who have not bothered really to take care because they have not known the value of its collection. Now we know it but we have got to have something to do it with.

Mr. YATES. Thank you very much.

How is your American Indian Museum coming along?

Mr. FORCE. We are hanging in there.

Mr. YATES. Thank you.

Mr. REGULA. Mr. Chairman, if you will yield, a central theme of this testimony has been that the ravages of inflation have created many of your budget problems because I assume you all represent institutions that have been thriving and growing for many years without IMS and you are saying that you are in this bind because inflation has debilitated the purchasing power of your memberships, and you are shaking your head. In any event what we are trying to do—we, the administration—is to solve some of the inflation problems which I think will also be an important help to you. Would any of you care to comment on that?

Ms. BONNEY. Yes. We have just begun to grow, mushroom in fact. While Pennsbury Manor has been around since 1939, the support organization within the community which is a very important and viable organization has become very effective only in the recent two years and IMS has, as I stated in my testimony, in just the six months that we have had it had a very great effect and we have had plans developed using this money, the rescission of which would just abort those plans.

Mr. YATES. Are you required by your IMS grant to match with outside funds?

Ms. BONNEY. Yes, we are. We can receive 10 percent of our total operating budget.

Mr. YATES. So that it does serve as a stimulant.

Ms. BONNEY. Oh, it very definitely does.

Mr. YATES. And it has been a challenge to your private community to help.

Ms. BONNEY. It certainly has been and it has done just that.

Mr. YATES. Would you feel the contributions of your private community would be as great or as soon if you did not have the stimulus from IMS?

Ms. BONNEY. That is hard to say because without the personnel that IMS has allowed us to bring on board we just won't have the people to go out and raise that kind of money.

Mr. YATES. Thank you.

I thank all of you. I appreciate it and I am glad to hear from you.

Mr. RABB. Thank you.

TESTIMONY OF JEFF NORRELL

Mr. YATES. Mr. Norrell, we have your statement and it will be made a part of the record. You may proceed.

[The statement follows:]

STATEMENT OF JEFF NORRELL

Thank you for this opportunity to testify against the proposed cuts in the budget of the National Endowment for the Humanities.

I am the director of a local history project in Birmingham, Alabama that is funded by an 18-month grant of \$160,000 from NEH. This project—called Birminghamfind—is helping Birmingham people discover the history and culture of their city by examining particular neighborhoods and ethnic groups.

Birminghamfind formed research groups in neighborhoods and ethnic groups to seek out—by going into attics and trunks and family picture albums and, most important, the minds of longtime residents—the history of Birmingham's Italians, Greeks, blacks, Jews, Lebanese, and five of its older neighborhoods.

With this research we are developing for each neighborhood and ethnic group an exhibit of photographs and other documents that travel from churches to neighborhood libraries to shopping centers to large office buildings. A 16-page booklet accompanies each exhibit. We have also produced several magazine pieces and 16,000 calendars that feature old photographs and interviews about Birmingham's history. As a result of our efforts, much newspaper and television attention has focused on the history of neighborhoods and ethnic groups in Birmingham.

We estimate conservatively that in the first six months of the project at least 25,000 Birmingham residents participated directly, not including people reached through newspaper, magazine, and television features that we instigated. In February, the seventh month, at least 25,000 more people participated in the project as we developed additional exhibits and booklets. By the end of 1981 we expect to have reached as many as half of the 700,000 residents of the Birmingham metropolitan area.

We are startled by the enthusiasm with which the public embraces our efforts. We hear people say time and again that "Birmingham has never had anything like this."

Part of the project's success, I am persuaded, results from its focus on things other than racial conflict, which the general public has up until now viewed as the overriding preoccupation of the city's history. For many local residents, Birmingham's history conjured up images of bombings, firehoses, and police dogs; it was a source of shame, something to be forgotten. I am further convinced that this overwhelmingly negative view of our history has handicapped efforts for interracial harmony, for neighborhood revitalization, for economic development, and for improved local government.

While we have not avoided the subject of racial conflict, our emphasis on neighborhoods and ethnic groups has suggested such themes as cultural diversity, communal harmony, and economic opportunity which are crucial to a real understanding of Birmingham's history but which have been largely ignored in the popular view of our past. We make no claims about the social and political impact of this project, but we see how it promotes keener, more positive community awareness.

The high level of participation in the Birminghamfind project also results from our decision to take the program to places where Birmingham people naturally go—to church, to shopping malls, to bank buildings, and to work places. We are getting participation from people to whom the traditional places of learning—colleges, libraries, museums—are unfamiliar if not unknown. In Birmingham these people make up a majority of the population, a group that deserves not to be overlooked.

Our experience demonstrates that they do not want to be overlooked. Given an opportunity to think and talk about their own lives—their families, churches, work, beliefs—people in Birmingham, regardless of educational level or economic status, respond with enthusiasm. The persons who have participated in Birminghamfind most extensively have been retirees, folks who have time to talk and to look at photographs and letters and who have reached the point in their lives when they want to

reflect, to achieve a better understanding of what their existence has meant. Many participants have been delighted to answer—perhaps because they have never been asked before—questions like “What kind of man was your father? Why have you been so loyal to your church? Have you experienced discrimination?”

Part of the success of the project must be attributed to its cooperative sponsorship. It is run by a consortium of more than thirty academic, business, civic, governmental, and religious institutions that have given extensive in-kind services, some cash, and much moral support to the effort. The project continually draws in organizations that help to broaden community participation. The collaborative aspect makes for cost-effective management and lends communal spirit to the effort.

For all the enthusiasm with which the Birmingham project has been received, it could not have happened without the support of NEH. Private philanthropy in Birmingham tends to fund the performing arts and, even so, two important arts institutions are in serious financial trouble today. In Birmingham and across Alabama, a high percentage of the programs that focus on local history and folk culture have taken their funding from NEH simply because there was no other source. Big cuts in funding for NEH will mean big cuts in cultural activity in Birmingham and Alabama.

Furthermore, if the Transition Committee's recommendation for the abolition of NEH's Division of Special Programs goes through, then broad public programs like the Birmingham project, which comes out of the Division of Special Programs, will not even be considered for funding. Should NEH turn away from efforts to reach the general public toward larger support for scholarly research in universities, as the Transition Committee recommended, then I think that very little future NEH funding will reach Alabama.

I urge you to reject the President's recommendation in favor of a more equitable and more far-sighted funding level for the Endowment.

Mr. NORRELL. Thank you, sir.

I am directing a special humanities project, a local history project, in Birmingham, Alabama that is focusing on the history of neighborhoods and ethnic groups in Birmingham. We are doing programs in the public. We do exhibits, small 16 page booklets. We do a theme calendar that looks at the history of Birmingham and we put them in places like shopping malls, churches, bank buildings, the most public places that we can locate things.

We estimate that in the past few months we have involved at least 50,000 people at the Birmingham population at least 25,000 in the month of February alone. By the end of this year 1981 we expect to have one way or another varying degrees of involvement brought by our local history project to at least half of the public of the 800,000 people of the Birmingham metropolitan area. We are somewhat startled by the success of this project, the way that the public has reached out and really taken to what we are trying to do. I think part of the project success so far has been the thrust, the themes that we have touched on.

As you probably know, Birmingham is a city that has had a great deal of racial conflict that has led to a very bad image of the city outside of the city and it has also led to a very bad image that the city has of itself. People think that Birmingham's history is totally a history of racial conflict, and while there has been that is not all there is to the history of Birmingham. We are finding by looking at things like the cultural diversity of ethnic groups, by focusing on the ways in which the community has offered opportunity and various other things to the people of Birmingham that it creates a kind of pride in the city and it creates community harmony that is a very positive thing in efforts for neighborhood revitalization and for economic development.

We think that the high level of participation that we have had results from our willingness to take the project to the people. We

think that there are a lot of folks at Birmingham who are interested in their own history and their own culture but who are not comfortable in some of the more traditional settings for learning in colleges, in museums and libraries. Those places are unknown to a lot of people in Birmingham and we think that at least in the case of Birmingham this is probably a majority of the people and that by taking things to them we are allowing them to participate in the humanities.

Our experience suggests that these people who are not comfortable perhaps in a college or a library do not want to be overlooked and that given an opportunity to talk about their lives, their families, their churches, their work, their beliefs, people in Birmingham regardless of their educational level or economic status respond with enthusiasm to the humanities. The persons who have participated in our project in Birmingham most extensively have been retirees, folks who have time to talk and to look for photographs and letters and these are the people who have reached the point in their lives when they want to reflect and to achieve a better understanding of what their existence has meant. Many participants are delighted when we have asked them, perhaps because they haven't been asked before, questions like: What kind of manners do you follow? Why have you been so loyal to your church? Have you experienced discrimination? *

Part of the success of the project also is the fact it has been a community or a cooperative affair. Some 30 academic, business and civic organizations have participated in it. We have continually drawn in new organizations and in-kind services from a variety of different sources and this collaborative aspect, I think, has made our project very cost effective and it has lent a communal spirit to what we are trying to do.

For all of the enthusiasm we have seen in Birmingham this project, of course, would not have happened without support from the National Endowment for the Humanities. Private philanthropy in Birmingham tends to fund the performing arts and even so there are two more cultural institutions that are in serious financial trouble today. In Birmingham and across Alabama a high percentage of the programs that focus on the humanities, on local history, on local culture have taken funding from NEH simply because there is no other source in Alabama.

Big cuts in funding for NEH will mean big cuts in cultural activity in Birmingham and in Alabama. Furthermore, if NEH is asked to or confronted with the suggestions of the transition committee and does away with the Division of Special Programs or if the current proposal for Mr. Duffy that the special projects be ended, then programs like this one in Birmingham that we think will involve half of the population probably will not come about. I think that Birmingham, while it has a peculiar history, is not unusual among medium-sized cities in this country that likes this kind of public program but otherwise will not have an opportunity to have one.

Mr. YATES. Thank you very much.

That completes the hearings for today. We will meet tomorrow at nine a.m. in this room.

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